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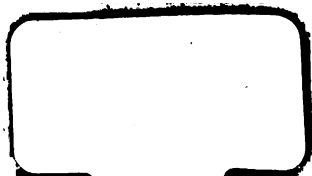
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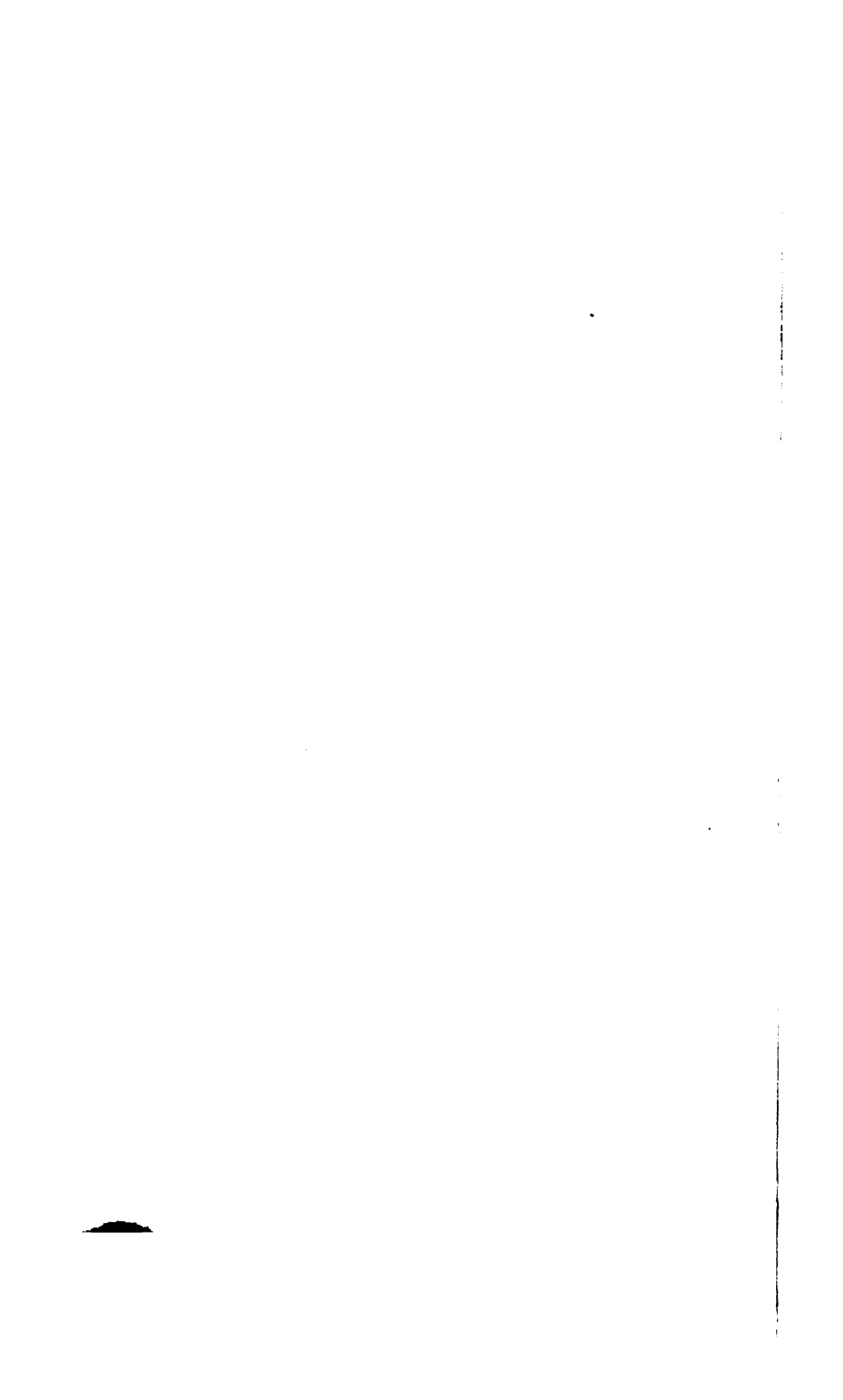


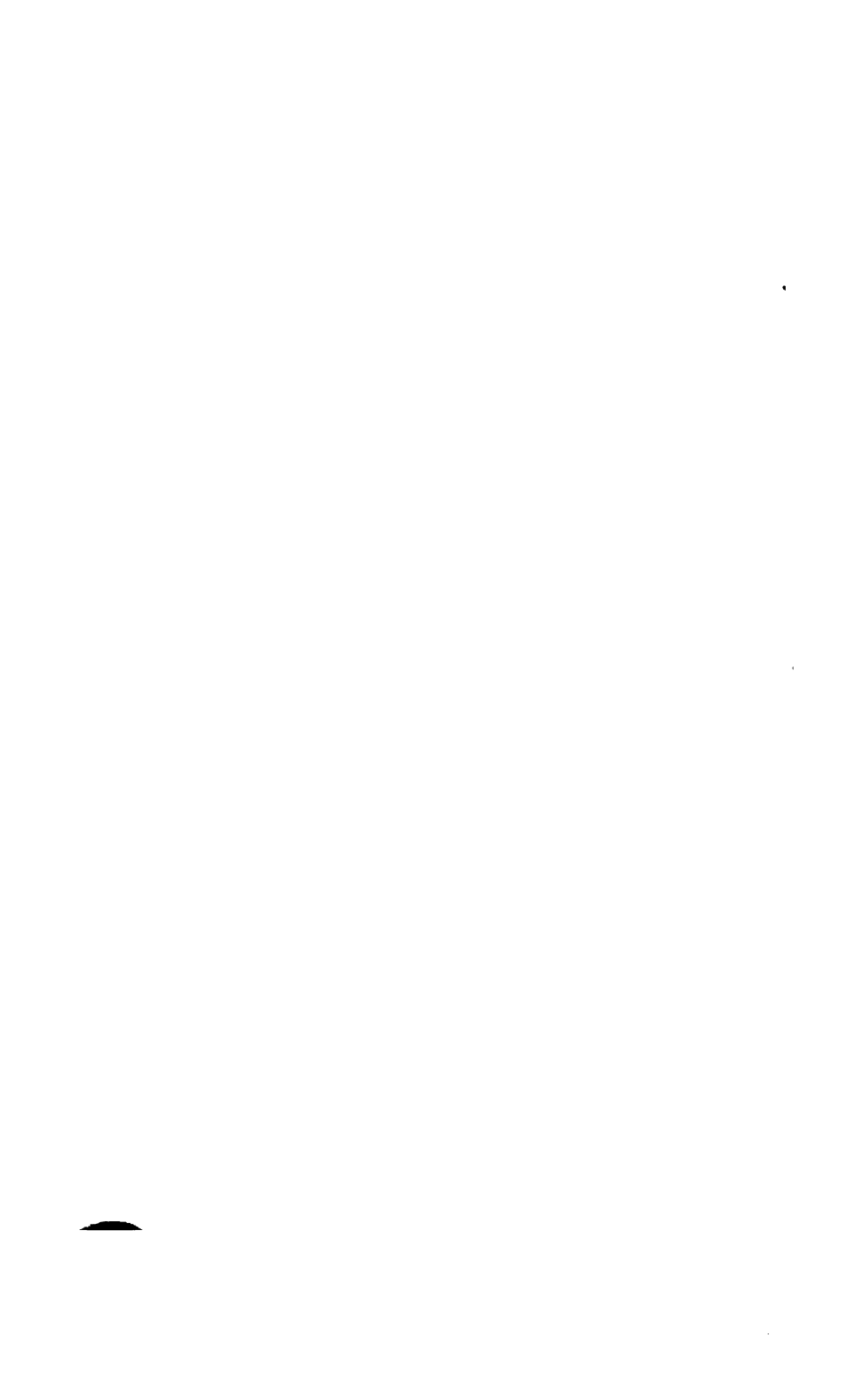
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An Attempt to explain the

OECONOMY

OF THE

HUMAN FRAME,

UPON THE

PRINCIPLES

OF THE

NEW PHILOSOPHY.

Vita igitur in sanguine consistit (uti etiam in sacris nostris ligimus) quippe in ipso vita, atque anima primo elucet, ulteriusque deficit, ut cuilibet cernere est, Sanguinem ultimo calorem (pulsus, vitæque authorem) in se retinere: quo semel prorsus extincto, ut jam non amplius sanguis est sed cruor, ita nulla postliminio ad vitam revertendi spes reliqua. Patetque hoc idem luculentius quia nec in omnibus animalibus neque omni tempore cor pulsans reperitur, cum sanguis tamen aut ejus Analogon in nullis unquam desideratur.

Vid. passim in Exercitat. LI. de generat. Animal. Harv.

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THE 121ST AIRBORNE DIVISION

C.B.

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THE Human FRAME.

INTRODUCTION.

THERE are two sorts of human Learning to learn: That which others have already learned, which comes by Instructions from Writings, Words, or Examples; and that which has not yet been learned, which is acquired by Observations, and Comparisons of Opinions, Actions or Things. This Age very unjustly prizes the one, and despises the other, admires old Knowledge, and ridicules new; which is the Reason we have so few beneficial Improvements. And it is observable, that Men who are Masters of, and full of the one, seldom do any considerable Thing in the other. Most Scholars learn to tell us, learnedly, what we know or have in use; few learn to tell us any thing we know not. Men who learn to mind Words, seldom mind

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Things; and Men who study Things, seldom mind Words. A Man may have vast Ideas or Conceptions of Things, and little or none of Words. And most People who spend their Time in discovering any thing we do not know, or which is not in use, tell it us but confusedly at first.

'Tis necessary that the Person who attempts to discover the Motions and Actions of Bodies whether Solids or Fluids, should have a large extensive Capacity, naturally, to compare many Ideas at once; a good Share of natural Reason, and be instructed so far in the Mathematicks as concerns the Solids, or Fluids he observes, to enable him to make just Observations, and to have sufficient Opportunity to make Observations and draw Conclusions; that he understand so much of one Language, that others, who understand the same Language, may understand what he designs should be understood. But 'tis not necessary that he understand many Languages, nor that he know how many have made deficient Observations, and drawn false Conclusions. Such a Multitude of Opinions are likely rather to perplex or deceive, than to direct him to the Truth. Nay as our Comprehensions are not infinite, the more Ideas he has of Things

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Things which concern not the Matter in hand, the less room he will have for those that are necessary.

The present Physicians read the Observations former Physicians have made; what Symptoms attend this or that Disease in their several Stages, and can thereby guess what the Patient has undergone, and what he has yet to undergo; and likewise the Effects that this or that sort of Medicine has had in clogging or discharging the Matter, which, in this or that Case, produces such or such Symptoms; but this should be the least part of a Physician's Skill. Few or none of them ever look back to the Cause, and shew us whence that Disease took Root, and what Causes produced those Effects. The principal Part should be to judge what the Matter is that offends, and how it offends; how it was produced or retained, and why it was not discharged; if any of the Glands have been too straight, to widen them; and if any have been too wide, to straighten them; or if the Juices have been too subtle, or too crass, to change them; if any sort of Meat, Drink, Action, either by Excess, Quality, or Deficiency, have produced it, to direct the contrary both in Quantity

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and Quality; that what offends might be discharged naturally without Force; and any new Productions or Increase of it, for the future prevented; why this is not better cleared, whether 'tis because they think so long as they act by Example, they are safe; or 'tis because it requires too much Labour and Study to understand natural Causes; or that 'tis below them to condescend to make Observations upon the most common or minute Things, and to begin to lay their Foundation on the Ground, and so build upwards; or that Disorders come by chance, and are best cured so; or that 'tis such a Mystery that it can never be made a Science, or that 'tis against their Interest it should be made so; or whatever be the Reason, till the prime Agents be known, which work every thing in us, and the Manner how they act, and their Actions be demonstrated by plain, simple, mathematical Rules (I had like to have said mechanical) 'tis impossible for them to lay down plain Rules how to prevent Disorders, remove them, or prevent their Returns. If ever those Matters be set in a clear Light, it must be by those who stoop so low as to make Observations upon all, even to the most minute Things,
Motions,

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Motions, and Circumstances, which any way affect, or concern the Body, and without Regard to the received Notions or Opinions, give Judgment as the Things appear to them; and whenever there is an Attempt to do it, 'tis the fairest way to let the Brat have no Credit, nor Discredit by the Parent; and if after 'tis set forward, it cannot live by itself, to let it die.

C H A P. I.

*Some Positions about the Motion of Bodies
in Fluids.*

I Attempt not to account for the Qualities of Bodies, either Solids or Fluids, such as Gravity, Elasticity, &c. Nor for ^{Primary} the Sizes, Shapes, or Figures of the first ^{Qualities} Corpuscles of each several Species of ^{not to be} Bodies, whereby each of the Bodies dif- ^{accounted} fer from any other in several Qualities or Attributes: Those, and the Consequences which result from them, shew the great Power and Wisdom of the Creator, but come not within the Reach of Observation: Thereby we can only know what Qualities, Sizes, Figures, &c. those Mas-

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ses which come under our Observation have, and how some of them move, and are moved, impelled, and rebounded by themselves or by one another, downward, upward, &c. and how others are interrupted, and rest, by the different Qualities, or different Degrees of those Qualities in their several Masses; and how those Motions are successively renewed or repeated, their Directions varied, and how they move and rest alternately, by the Diminution, Augmentation, or Complication of some of those Qualities occasioned by the Alteration in Magnitude, Figure, or Dimension of some, the Masses being divided, united, compressed, extended, &c. And consequently how the several other Qualities or Attributes which result from the Size, Figure, Contexture, Mixture, &c. of the Masses, such as blunt, sharp, hard, soft, porous, solid, brittle, flexible, &c. are altered or complicated.

In the common Course of Nature here, all Compositions or gross Bodies are formed, and all Corpuscles, or small Masses move in Fluids; and they and the Fluids are moved, either by external Causes or Agents, as Wind moves the Water, and Bodies in it, &c. or by the Impulse of some Agents put into Motion before they enter

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enter the Fluid, as Corpuscles of Fire in Steam move Fluids, and the Bodies in them, as they pervade, &c. or by the Pressure of the Atmosphere, or by the Quality of Gravity, or Elasticity. The small Bodies or Masses in Fluids move, and are moved, by the different Qualities, or different Degrees of Qualities, in them, and the Fluids. Every Mass of any considerable Bigness, immersed in a Fluid, which weighs more than the same Bulk or Dimension of that Fluid, will sink in it, and every one which weighs less than its Bulk or Dimension, will swim in it. But small Particles or Corpuscles of Bodies, which in Mass have not much more or less Gravity than the Fluid, especially if the Particles be extended in Breadth or Length, or the Fluid be in Motion or agitated, will hover or be tossed about in that Fluid and not sink, or rise suddenly: If they differ much in Gravity, and be of proper Figures for Pervasion, they rise or fall with Celerity, in Proportion to that Difference of Gravity and Fitness of Figure. But the same Matter will be moved in different or opposite Directions, by altering its Gravity or Figure, or the Gravity of the next neighbouring Bodies or Fluids, by Addition, Subtraction, Multiplication,

tiplication, or Division, performed amongst themselves, by their other Qualities in their Motion. If a lighter Body be subtracted, separated, or taken from an heavier Body, the Body lighter than the Fluid will rise, and the Body heavier than it will sink, or rest at the Bottom. If the Number of Bodies which will hover in the Fluid be multiplied, either by adding more Corpuscles of like Gravity, or by dividing the Masses which sunk in it, or &c. for Example, Sea Salt, Sugar, &c. dissolved in Water, the Fluid will be heavier, and those Bodies, which had a little more Gravity and sunk in it, will swim, & *e contra*. If Bodies which hovered or sunk be divided small enough, or have lighter Bodies joined to them, those which subsided may rise into or swim upon the Fluid, and those which hovered in it may swim upon it; nay, even both may rise out of that Fluid, and hover or swim in a lighter Fluid, as out of Water, into Air, &c. When any Mass in a Fluid is expanded or stretched into a Bubble by the Corpuscles of Fire, volatile Salts, Air, &c. till it be lighter than the Fluid, 'tis press'd up with Velocity in Proportion to its Difference in Gravity to the Surface, and there swims

or bursts, and its Parts fly into or swim in the Air, as those of Barm, Soap, &c. or by the Quality of Elasticity, for the lighter the Fluid, the more, small Bodies in it, which have Elasticity, will expand or extend themselves, and the Fluid, and then Bodies which swim in that Fluid will sink; and the heavier the Fluid, the more such Bodies will be compressed in it, and that will make the Fluid still heavier, and Bodies, which sunk in it before, will then swim. Or by the Elasticity, or Adhesion of the Parts of Bodies when they are split or divided, which jirk upward or downward, this Way or that Way, expand and make the Fluid lighter, and throw themselves or other Bodies they strike upon, or adhere to, in any Direction or upward, out of the Fluid. Bodies in a Fluid move like Weights in the Scales of a Balance, when one subsides, others go up with Force and Velocity, proportionable to the Difference in Gravity or Levity to that of the Fluid, the external Impulse, Pressure, Distance they move, &c. And the Fluids and Bodies next adjoining take their Places, and so successively others take the Places of them, till the sinking Body rest, each of the adjacent be mounted a little higher;

er, and each placed according to their respective Gravities. When Fluids, &c. fill any Vessel, which may be extended, and whose Sides are of equal Strength, and equally compressed; if one Side be pressed more inward than the rest, all the opposite Sides must be pressed as much in the whole outward; when the Fluids, &c. expand such a Vessel, which contains them, it must extend equally in all Parts, their Gravitation upon the Bottom and Sides only differing: If the expanded Fluid gets vent, and issues out in any part, it will issue with Force proportionable to that which impells or expands the Fluid, the Compressure of the Sides of that which contains it, the Straightness of the Aperture, and its own Gravity, if it descend; only lessened by the Pressure upon the Aperture, and its own Gravity, if it ascend: And that Spout will continue issuing so long as the Fluid expands, or rarifies beyond the Capacity of the Vessel: If it be conveyed thence in a Pipe, shut at the farther End, and empty, which is not more or less compressed, than that it issues out of, it will meet with no Resistance till it come at the End of the Pipe: If the Pipe would widen or straighten as the Force within, or the Compressure without

without prevailed in the whole, or in any one Part more than another, and the Force which drove the Fluid were to operate all at one End, like a Pump or Forcer by Jirks, and the Compressure without were equal in all Parts, the greatest Force or Stress would be at the End of the Pipe, next the Pump, it would extend most, and be liable to burst the soonest there; and the Extension would be still lesser at the greater Distance from the Forcer; if the Compressure were lessened or taken off that or any other Part, it would be more extended there in Proportion, and if the Compressure were increased in any Part it would be straightened there in like Proportion. If what expands and drives the Fluid go along with it, or in it, and the Pressure be equal on the outside, it will be equally expanded in all its Parts. If many Pipes or Tubes never so slender or weak made of Matter, which will extend to such a Degree, environed with a Case or Compressure, sufficient to keep them all from extending beyond that Degree, be equally extended by the same Force, at the same Time, till they fill the Case, and one press against another, be that Force never so great, none of them will burst; if the
Case

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Cafe will extend and contract, and the Force which extends the Tubes be greater than the Compressure and Strength of the Cafe, it will extend, if lesser it will contract; if the Force in any one of the Tubes or Pipes be less than the rest, it will contract more than the rest, if greater, extend more than the rest.

Our Bodies are so surprisingly contrived and adapted to the Qualities of inanimate Bodies and Fluids, that every Thing, within and about us, acts according to the Laws of (*the Agents which they ignorantly call*) Gravity, Fluidity, Elasticity, &c. The Fluids within us move and are moved, by such Impulses, as they are without; and such Corpuscles, as are sharp, smooth, &c. without our Bodies, are so within, and are united, divided, and separated as they are without; and they are no otherwise changed within, than they are without, viz. by Union, Division, and Separation, which is occasioned by their Motion, Taction, passing Strainers, &c. And the Motion of the Fluids within, is encreased by greater Proportions of volatile Spirits, Fire, &c. as they are without, by greater Emissions of Heat from the Sun, from Fire, Manure, &c. and retarded by a greater Proportion
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of Cold, heavy Matter, &c. with this Difference, that every living Body needs Supplies of Matter, to furnish Agents to keep the Motions going, and the great Body of this Globe needs none, except Heat from the Sun. And perhaps the Motions of the Fluids in both are, in some Measure, altered by the Qualities in, or Motion of, the Moon and other Orbs. Man's Body is formed of Parts called Supporters, Pillars, Clothing, or Covering, Partitions, Rollers, Wedges, Levers, Pulleys, Cords, Presses, Bellows, Sieves, Strainers, Canals, Receptacles, and by many other comparative Names which the Anatomists use. Each is at first formed in the Womb of a Woman, and by her nourished. After its Birth, the Stomach and Guts, are successively filled with what it eats or drinks, from whence the other hollow Vessels are filled with Fluids, some with a Mixture of all sorts together, some with this, some with that sort separated; the greatest Part kept in perpetual Motion, some small Quantities kept stagnant to supply proper Occasions at proper Seasons; the whole is so framed, as to need a continual Supply of proper Matter in the Womb, to form and nourish it; and after that, to keep the Parts of it
in

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in Motion, and to augment for some time, and to supply the Waste of those Parts. That Matter is composed of a Mixture of various sorts of Fluids, and Atoms, of various sorts of vegetable Matter, &c. which lies dispersed through the whole Surface of the Earth, in the Waters, &c. The Atoms of Fluids are raised in Vapours, sink into the Ground, rise and pervade the Earth in Steam, and they, and those of the Solids, are by the same Agents, as act in and upon Man's Body, raised in the Surface of the Earth, and collected by the Fibres of the Roots of Trees and Plants, in a sort of Halitus or Steam, carried along their Tubes through several Strainers or Glands, part nourishes, forms, and encreases the Roots, Stems, Branches, Leaves, and Fruit, and part is discharged as Excrement. These Atoms thus collected, and formed into Roots, Plants, Seeds, and Fruits, are some of them fitted for the immediate Nourishment of Man, some for his other Uses, some fitted for the Nourishment of Beasts, Birds, Fishes, &c. and of several sorts of these Animals, some are fitted for the Food of Man, some for the Food of other Animals, some for the Service of Man, and all for his Benefit, as I have shewed

shewed in another Place *. Those fitted for the Nourishment of Animals are by them collected and preyed upon, and their Bodies by the same Agents, in the Stomachs of those which eat them, are again divided, and what is fit to form and keep their Parts in Motion, and to grow and supply their Parts, is carried off from the Stomach, and Guts, in Steam or Halitus, sorted by Glands, &c. and the rest discharged in Excrement. The Flesh of those fitted for the Food of Man is by the same Agents again divided in the Stomach of Man; part carried off in Steam for the Uses aforesaid, and part cast out in Excrement; so nothing is fitted for those Uses in Man till it has several Times, at least once, been divided infinitely small, carried from the Earth, or Excrements in Form of Steam, passed proper Strainers, and been separated from the useless or hurtful Atoms.

* See Vol. XII. State of Nature.

C H A P. II.

The Things necessary to keep these Fluids in Motion.

THE Things absolutely necessary to keep these Fluids in Motion, and to move the Parts, &c. are, 1. A sufficient Quantity of such properly prepared Fluids and Solids taken successively, at proper Distances of Time, into the Stomach, without which, or by the Excess or Defect of which, the Fluids will run too fast, or too slowly, and in a short Time stand still. 2. The natural Compressure of the Air, which is common to all, in all Places, unless taken off by Art, and then there is immediately a total Cessation of all Motion. 3. A sufficient Degree of Warmth or Heat from the Sun, Fire, Clothes, Action, or &c. In this we generally err in Excess by Custom, and Man might live much cooler than we keep ourselves. But an extraordinary Defect of this sometimes occasions Efforts, which we call Fevers, and in a short time puts a stop to the Motions of the Fluids, sometimes suddenly. 4. Air sufficiently pure,

pure, to serve for Respiration, this is generally common to all, except it be taken away by Art, or fouled by some Accident, or where it cannot have Motion, and in such Cases that Defect puts an immediate stop to all Motion. 5. Rest or Sleep, without which in a short Time their Motions are soon disordered, and in a short time after, cease. But as I take the two first to be chiefly concerned in what I am enquiring after, I shall first consider what concerns them, and the other three only accidentally, or afterwards,

C H A P. III.

The Qualities of the several Sorts of Matter put into the Stomach, and of the Juices secreted into it, out of the Blood.

IN order to have some Notion of the Operations performed in our Stomachs, it will be necessary to consider the different Sorts of Matter put or secreted into them, what natural Qualities they have, what Figures their Corpuscles are of, which of them may be considered as active, and which as little other than passive, what

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external Causes compress, move, or affect them, what Motion and Effects those Bodies with such Qualities and Figures will, when all together, and wrought upon by such external Causes, produce one upon another, and upon what contains them.

The several sorts of Meat we eat and drink, I, suppose, are composed of Corpuscles of Water, Oil, earthy Matter, Salts, Air, Fire, and Cold mashed and mixed all together, and along with them, the Saliva or Spittle secreted out of the Glands in the Mouth * and Throat, and a subtile Fluid like a Mixture of Salts and Spirits meets them there, which either is secreted or issued into the Stomach, or constantly remains there, and such a Quantity of Corpuscles of Fire, as form what we call natural Heat.

Qualities
of Water.

The natural Qualities of Water are Gravity and fluidity, whereby every Body, heavier than its Bulk of Water, sinks in it, and every -one lighter swims, and when any other sorts of Matter are mixed in it, those Qualities are encreased or diminished

* Or thus, a lubricating Mucus from those of the Fauces, and a Liquor analogous to that of the Salivary Glands, which is constantly secreted, and issuing into the Stomach, and a Quantity of, &c.

ed in Proportion to the Degree of those Qualities in the Mixture. Its Corpuscles are extremely light, small, and capable of being expanded, divided, and carried off by corpuscles of Fire, Air, Spirits or volatile Salts, and are round, smooth, or so figured that they pervade, but do not wound or cut other Bodies, nor divide the corpuscles of any Body except Salt, but impell what they meet with in Proportion to the force which impells them. Whether the corpuscles of Water be so small, that they can be formed into a fluid so thin, as to carry Matter to form and nourish the several Tubes of which an Hair is composed; or whether there be corpuscles of different Sizes in Water, or whether there be fluids, whose corpuscles are smaller than those of Water, mixed in it, and other fluids, to which Names are given, I am not certain.

Those (*Qualities*) of Oil are Fluidity of Oil, and Gravity, some sort have more, and some less. But any sort, Fluidity in a much less, and in most sorts, Gravity in a lesser Degree, Bulk for Bulk, than Water. However its Corpuscles are figured, they are light, small and capable of being expanded by Fire, Air, &c. but not easily divided or driven off in Steam, without a

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considerable Proportion of Fire; not capable of wounding or dividing other Bodies, but of intangling with one another, and with the Corpuscles of any solid Body; capable of insinuating themselves into the Pores of most Sorts of Bodies, not capable of being mixed or intangled with the Corpuscles of any Fluid: But I think sheaths, entangles, and contains, or admits a greater Quantity or Proportion of Corpuscles of Fire, than any other Fluid or Body, as appears when it is fired; and from the degree of Heat it takes to make it boil,

Of Vegetable Matter.

Earthy or vegetable Matter has Gravity and Solidity, and some sorts of it Elasticity. In Mass, some sorts have more Gravity than Water, and some less, in Corpuscles nearly the same; and 'tis most likely they are flat, thin or fibrous, framed to compose the Parts of our Bodies, not capable of wounding or dividing, but of adhering to one another, or to other Bodies; liable to be divided by Corpuscles of Fire, or Salts, and so light as to be born along with Corpuscles of Fire, volatile Salts, and Air.

Of Salts.

Salts have Solidity and Gravity. In Mass, most Sorts have more Gravity than Water; in Corpuscles some nearly the same

same. Some which are lighter than; or will swim, or rise in the Air, or be elevated by the Heat of the Sun and Air, which I take to be much the same as Fire, but something larger, because Glass will let go Fire and hold them, and may be called volatile active Salts; and some which the Heat of the Sun and Air cannot move or bear off, and may be called fixed Salts. Some Sorts of them are blunt or sheathed; others matted, or they appear to be so; but most Sorts are pointed or figured, so that one Sort or other, or a Mixture of some Sorts of them, will divide the Corpuscles of most Sorts of solid Bodies, some in the Fluid of Water, some in the Fluid of Air. Their Corpuscles are liable to be divided, some by Fluids and some by Fire; they are capable of adhering to one another, and to other Bodies, and consequently those which are lighter than Air or Water, are able to make Corpuscles of other Bodies or Fluids of greater Gravity, than the Fluid which they are contained in, swim in it with them; And those which are heavier, to make other Corpuscles of lesser Gravity than the Fluid in which they are contained, sink in it with them. Whether each sort of Spirits be composed of a distinct Species of Corpuscles, or they

are more or less sheathed, or sheathed in different Sorts of Matter, I cannot determine. But I take what we call Spirits to be volatile Salts, sheathed.

Of Air.

Air has Gravity, Fluidity and Elasticity; Gravity in a less, and Fluidity in a greater Degree, than Water. How the Corpuscles of Air perform their elastick Operation, whether each of them is formed like two Sides of a Triangle, and the Pressure of the Atmosphere keeps them bent at a different degree, at each different Depth of the Atmosphere; or a greater Pressure compresses them to more acute Angles, and a less suffers them to open to more oblique ones, and to form thicker or thinner Air; whether the Corpuscles of Fire are so framed, as only to enter between their outsides, and expand them by their own Space, and make the whole lighter by the Difference of Gravity; or whether they also enter between the Legs of each Corpuscle, and extend them in Proportion to the Force they are driven in with, and make them contain a greater Space, and so weigh lighter than both asunder, by varying each other's Specific Gravities, as 'tis called, or whether the Corpuscles of Fire can extend little Masses of Air like Bubbles of other Fluids, I cannot

not determine. And whether, when a Body moved in Air, receives a new force by the Air, as a Fluid pressed after it, or by the Sort of Vacuum it makes, those Corpuscles of Air extend their Legs, and set it forward by their elastick Force; and whether these Jets be not the Cause of the swift Motion of Corpuscles of Fire in it, deserves well to be considered. The Corpuscles of Air, when they are not impelled by some other Agent, separate from all other Fluids, and collect into their Place; according to their Degree of Gravity; and will not in a Body ascend through any other Fluid, unless formed into Steam by Corpuscles of Fire and other Fluids, nor even then thro' any dense solid.

'Tis hard to know whether the Cor-Of Fire: puscles of Fire have any Gravity, or whether they adhere to one another, so as to form either a Fluid or solid Body. If they have Gravity, or are attracted towards the Center of the Sun, 'tis hard to conceive how any of them, with how great Force soever they are thrown; could come from thence hither. Whether they be of different Size to require different Forces to move them, and larger than those which form Light, I am not certain: But the Fermentation in some Sorts

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of Wood, whilst it is, as we call it rotting, and some Bodies in the same Condition, emit Light in the Dark, and when that Wood is sufficiently fermented or rotten, a little Fire will consume it, and it will emit little Light or Flame, and the Fire will appear redish, which induces me to believe that Light consists of Corpuscles smaller than Fire, or that there are Corpuscles of Fire of different Magnitudes, or of different Gravities; however they are so small and so sharp, that they by the Pressure of the Air pervade, and in sufficient Quantity, divide the Corpuscles of almost all Bodies, except some few whose Pores are so close that they cannot enter in sufficient Quantity; and some others, which are so open and their Corpuscles so hooked or twisted that they cannot divide them, pervade between and keep at a Distance the Corpuscles of all Fluids, and in Quantity expand them to a great Dimension; and so light, that, adhering to the Corpuscles of other Bodies, make those which would have sunk alone, swim in Water, Air, &c. and to make Corpuscles of Water, Oil, &c. which would have sunk, to swim in Air, so that the Air would press them, if alone, to its Surface. But 'tis likely they are so very small,

small, that as soon as they are freed and loose, by the Impulse they receive at Separation, which, as it happens, is in all Directions, the Air presses those which fly sideways, or downward, again to the fuel successively, and those which go upward entangle with the Matter they bear off with Air, with Particles of Moisture or other Matter, and are detained in the Air, Water, &c. and descend with them to the Earth, so that a vast Quantity of them lie entangled in all sorts of Matter, and may be freed and set to work by friction, fermentation, &c. And supposing a Creature alive and healthy, supposes that there is a sufficient Quantity of these Corpuscles in its Body to keep the Juices thin, fluid, and as we call it warm, sufficient to commence a new fermentation; and the Absence of these Corpuscles is Death.

Whether, what we call Cold, be only Of Cold. the Absence of the Corpuscles of Fire, whereby the Surfaces of the Corpuscles of Fluids are suffered to come nearer together, and become less fluid or more solid, or whether it be Corpuscles of Matter which can pervade the Pores or Intervals of Solids and Fluids, and entangle those of Fire, and hinder their Operation, or are so shaped,

shaped, that when intermixed among the Corpuscles of Fluids, they fill the Intervals closer, or by Roughness, or &c. make them adhere together; or whether when they pervade a Vessel full of hot Steam, they affix to the first Corpuscles of Fire, and make them, and so they make one another subside; or whether the Corpuscles of Fire in an Instant pervade the Vessel, and fly to the outside, where there is a Vacuum for them, by Absence of their Species, and so desert the Corpuscles of Water, &c. which they bore up, to subside, I cannot tell. But if there be such Corpuscles, 'tis likely they have more Gravity than those of Fire, and perhaps more than those of Air, and must be very small, and so shaped to pervade, where Air nor any other Corpuscles except those of fire, can. But whatever their figures be, they seem either to be blunt, or incapable of being mov'd briskly, or strongly enough to divide the Corpuscles of other Bodies.

Of the Saliva.

Whether the Saliva or Spittle be only a thin fluid; to make the Meat break and pass down more easily, softened with some slimy Mixtures, to keep the Parts of the Mouth and Throat supple and prevent friction, or whether it have any Corpuscles

cles in it proper for fermentation, is not certain : But it is adapted to be vastly expanded by a little Heat, and that Matter, which meets the Meat and Drink in the Stomach, is doubtless framed for fermentation and Division, and consists of a Mixture of Salts and fluids ; whether they have Gravity sufficient, or how they are kept in the Stomach, when the rest is discharged, or whether they secrete or are issued into the Stomach before the Meat and Drink are put in, or when they are put in, or during the time of their Dissolution, or continually, will hereafter be considered.

Hence Water, Oil, earthy Matter, and Cold may be termed inactive or passive, and Salts, Fire and Air active.

C H A P. IV.

The Corpuscles of such different Sorts of Bodies and Fluids mixed in the Stomach and Guts, will dissolve the Bodies in them, raise Steam, &c. proved by the Effects such Mixtures have out of the Stomach.

THE Trunk of the Body is always filled by the Bowels and Guts, and the Stomach and Guts are more or less distended, as they are more or less filled by Meat, Drink, or Steam, into the Space which contains the Lungs, and as the force which extends them, or the force of the Atmosphere prevails, the Case of the Belly is extended more or less. The more the Stomach and Guts are contracted, the more space the Lungs have to play in. As the Lungs extend, they partly compress the steam in the Stomach and Guts, and partly extend the Case of the Belly. As the Lungs contract, the steam in the Stomach and Guts expands part, and the case of the Belly contracts part. The Liver, Milt, Kidneys, &c. are thereby

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by compressed and relaxed, of which more hereafter.

The Atmosphere without, compresses the Stomach and Guts, and the Steam within, distends them. The Action of the Lungs, by pressing and relaxing, moves them, when the Body is at rest: And the Motion of the Parts in Action and the Agitation of the Body in Motion, shifts and renverses the Matter in the Stomach and Guts variously.

When all the sorts of Matter aforesaid are mixed in a thick Fluid in the Stomach, there is at first the Pressure of the Atmosphere upon every Side of the Stomach, and the Gravity of the Matter, and the Elasticity of the Air mixed in it, so that if the Stomach were not moved, the Particles of Matter which are lightest, must make up to the Surface, with force and speed equal to these two Pressures, the Elasticity of the Air, and the force gained in their Motion. Suppose a Corpuscle of Fire or volatile Salt at the Bottom, it ascends till it meet with a Mass of Matter, and with one of its Points strikes between two or more Corpuscles, and if their Adhesion be not too strong, splits them, and they fly the one the one Way, and the other the other, with a force

force equal to the Strength of their Adhesion: The Corpuscle pursues its Way upward by the same Impulse, and if the two split ones, or one of them, be either Fire, Air, or volatile Salt, it strikes against some other Body, or is pushed back by the Fluid, or begins to mount upward, and act as the other. If they be Matter as heavy as the Fluid, they attend till other Corpuscles ascend and split them, and so on, till all the Corpuscles of Fire, volatile Salts, and Air, after many Oppositions get to the Surface, and if there be Space there, the most volatile form a Steam which presses stronglier. But by the Motion of the Lungs upon the Stomach, and the Motion of the Body, the Contents of the Stomach are frequently inverted or turned topsy turvy, so that the lightest Corpuscles are continually aspiring and dividing the heavier, and continually turned down, and the heavier fixt Salts contribute by friction till they, by dividing the Matter infinitely small, make it take up a greater Space; and by the bustle the Corpuscles make in flying this Way and that Way with great force, and the Elasticity of the Air, expand the fluid in Proportion to the Quantity of the Agents, and their Agitation; so press strongly
against

against the Stomach, which is strongly compressed by the Air without, and thereby the volatile Matter, as the Corpuscles of Fire, Air, volatile Salts and Particles of the Water, Oil, and earthy matter to which they adhere, or which they can drive along with them, press into the upper Parts of the Guts, and thence into the lacteal Vessels, where they only find Vent in form of Steam, and by that force drive the crasser Matter, which will not pervade them, downwards.

If the volatile Matter were suffered to rest at the Top of the Stomach, or go off freely, as it ascends successively, the fermentation would soon cease, or go on very slowly, as it does upon the Liquor in a Guilefat unmoved. But the Motion of the Lungs and Body renews the Operation, as beating in the Liquor in an open fat does. But if fermenting Liquor be in a close Vessel, especially if it be moved much, it will make the Vessel extend, and if it get not Vent for the Steam, burst it; if it get Vent, issue in Steam and Bubbles during the ferment. When in an open Vessel, the Matter in the fluid is sufficiently divided, and those Bodies which would ascend gone off, or sheathed in, or adhered to, other Corpuscles, so that

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that all are divided, or balanced to near the same Gravity of the Fluids, some few Parts of the earthy or crass Matter will leisurely subside, and some few of the lighter will swim, and the rest be quiet; as old Ale, Wine, &c. till put into a new ferment by Motion, or some other Accident or Agent. Where the Corpuscles that constitute the Fluid are of near the same Gravity, such as distilled Spirits, &c. they cannot be put into fermentation by any Motion, nor will they dissolve any Body immersed in them. But the Matter in the Stomach is of various Gravities always compressed by the Air without, and extended by Steam within, because it requires a great force to drive the Steam along the Fluids in the Blood-vessels, quite out at the Lungs and Pores. And whilst the Lungs play, the Stomach and Guts are never suffered to lie one Minute still, so nothing in it can cease to ferment and emit the Steam, unless there be such a Quantity of Matter so cold, or so incapable of being acted upon, that the Agents be overpowered.

These volatile and active Salts and Corpuscles of Fire act much the same Part, and after the same manner, upon Matter in the Fluids within the Stomach, as Fire
or

or active Salts do upon Fuel in the Fluid of Air in a furnace. The Pressure of the Air and of the Fluid, and the Motion of the Fluid moves, and enforces the Corpuscles of volatile and active Salts and Fire, to act upon and divide the Bodies in the Fluid, as the Pressure and Motion of the Air moves and enforces the Corpuscles of Fire and active Salts, to act upon and divide the Parts of the Fuel in the Air. And Fluids beat back the Corpuscles of Salt to the Matter, as the Air does those of Fire to the Fuel. And 'tis likely that the Corpuscles of volatile Salt, bear near the same Proportion of Gravity to Water, as those of Fire do to Air, and as there are Fluids of different Gravities, so there are Salts of like different Gravities, and 'tis likely of different Sizes, to fit the Pores of different Bodies, and 'tis likely the lightest sort, which I call active, and some of the volatile Salts, act jointly with Fire upon Fuel in the Air, as 'tis visible they do in Sulphur, as well as those of Fire act with Salts in the Fluid of Water, &c. And some active Salts or Spirits, when very pure, raise a Steam, when exposed to the Air, nearly resembling Flame or the Corpuscles of fire, pure and nearly united. And the Dissolution of Bodies

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by volatile Salts, &c. frees more Corpuscles of volatile Salts, &c. as the Dissolution of Bodies by fire frees more Corpuscles of Fire; and thereby the Actions are encreased; if the Motion continue, and there be sufficient fit Matter to work upon in Proportion to the Agents, freed Salts by their Agitation, and the Rebounds of them, and the Parts they divide, expand the Fluid containing them, in Proportion to their Motion and Agitation, as those of Fire do that of Air. Salts, and Fire, and Air, bear off the small Particles which adhere to them in form of steam from the Stomach, as fire does small Parts of the Fuel, in form of Sparks or Smoke, and that Matter which is too heavy to be born off, and which the Strength of the Agents is not sufficient to divide, subside as Cinders, Ashes, &c. do in Fire in the Fluid of Air. Air contains Corpuscles of Fire, as Water does those of Salts diffusedly, and when such a Quantity of fire or Salt is collected as to act, those of the same sort join, fix upon the Body, and assist, as the Air or fluid moves them thither. Corpuscles of fire or Heat, as is most visible in Rooms where there is Fire burning and People perspiring them, are agitated, divide the Bodies in the Air, and perhaps the united
Cor-

Corpuscles of Air, and expand or adhere to the Corpuscles of Air, &c. and make them lighter, so that the Pressure of the circumjacent Air bears them up the Chimney, and fresh Air succeeds them, to agitate the Fire, and make its Corpuscles move and act; and 'tis likely supply more Corpuscles of fire, and perhaps with some nitrous or other Matter like Cold, because it burns better in cold Weather than in hot. In like manner the light Matter in fluids rises, and the succeeding Fluid supplies more Salts, &c. Thus ripe fern-seed, when one has stript them out of their Cods, and by the Pressure of the Air, or by the Corpuscles of Heat in it, their Skins burst, by that force and their own Elasticity jump up, fall down, and rebound so as to make a mighty Bustle. Thus the Corpuscles of some small sharp Salts called Acids, in a Fluid pressed by the Air, instantly enter the Pores, split, and divide the Particles of some other Salts, and jet the Parts each Way, and they rebound from one another, or are pressed back by the Air so as to cause a mighty Bustle and Explosion, and raise a fume like Smoke, and a small Quantity of them in the Stomach by the same Operation cause a sudden Effervescence there, and sweat all over the Body. Thus

the Corpuscles of fire, moved quickly by the Pressure of the Air into the powdered Charcoal and Sulphur, and exciting the latent Corpuscles of fire and volatile Salts in them mixed among the Particles of Nitre, suddenly split them, and expand and burst the small Masses, and the split Parts by that Pressure, their own Elasticity, the Elasticity of the Air, and the Rebounds from any Thing which resists their Expansion, cause that terrible Explosion, and drives them off in form of Steam or Smoke, with that infinite force and Velocity, which we see in fired Gunpowder, that Way where it gets Vent; and in Proportion to the Space it has for Vent, and of the Sides which resist and encrease its force by rebounding. As the force of fire is encreased by being confined and rebounded on more Sides, more, so there be but sufficient Room to admit the Air, and let the Smoke pass, and the force of the Smoke which goes off is encreased by the Narrowness and Length of the flues, and by the Number of Checks in them, and the Thickness or Closeness of their Sides, or what defends it from the Cold, as in Gunpowder, &c. So the force of Steam raised from a Fluid by Corpuscles of fire pervading the Pores of that which contains it, or by fermentation

tation, is encreased by being confined and rebounded, and in its going off by the Straightness or Length of the Pipe, and Turns or Checks in it, and by keeping off the Cold from condensing the Steam, as from the Stomach, &c. When we intend to burn any Thing, we estimate what Quantity and what sort of fuel is necessary to consume it. When we dissolve or ferment any Thing, what Quantity and Sort of Diffolvent or ferment is necessary, what Addition of other Things is necessary for them to work in, what previous Preparation they need, what manner they ought to be placed in, what Helps or Assistances may be given to them, in the Operations by Motion, Impulse, Pressure or the contraries, or if the Operation be too strong, what Sort, Quantity, &c. of Matter is proper to allay it, how it is to be applied, &c. The Case is much the same in our Stomachs, and like Causes have like Effects there. And we ought to eat and drink Things that will be easily or difficultly dissolved or born off, according to the various Degrees of Exercise we are to use, &c.

Where there is such Matter as Barm in Ale, or Phlegm in the Stomach, or any other Matter of a tough fibrous Constitution, so that it can environ or enclose

small Masses of fluids, &c. the Corpufcles of Salt and fire, can expand the Masses of the Fluid contained in the Phlegm, extend the Fibres of the Phlegm each Way, till it form a round Bubble whose Sides rebound the Corpufcles, and augment their force. As soon as the Bubble is of that Size, that it is lighter than the fluid, it makes upward, and sometimes burfts in the Way, and causes an Explofion, sometimes rises to the Top, extends vastly, and burfts there; after the same Manner in Proportion, to the Degree of Heat, as a small Quantity of fluid enclosed in a Stick or Stone put into a fire is expanded, and burfts the Body which incloses it, with a vast force and Noise, or as Ale or other fermenting Liquors burft a close Vessel. 'Tis thus Dough rises by ferment: 'Tis thus Soap composed of Salt and Oil moved in warm Water, raises a Lather of Bubbles. And in Proportion to the Closeness and Strength of the Phlegm, the Strength of the Agents within it is increased; as the force of fire is increased by the Strength and Closeness of the furnace; of the Barrel which encloses fired Gunpowder; of what encloses the Fluid in a Fire, or before the Fire, as the Skin of an Apple, the Shell of a Nut, &c.

Thus

Thus Masses of Phlegm in a Fluid which could never be divided by the Strokes of pointed Salts or Fire, in a Guilefat, or in the Stomach, &c. are expanded till their Sides be infinitely thin, even beyond Imagination, and are rendered capable to go off in Steam, to mix equally in the fluid, &c. * Nay even the Tubes and Bladders which compose flesh, fruit, Herbs, &c. even to the most Minute, have Juices within each of them, which when they come into the Stomach, and are pervaded by Corpuscles of fire, subtile Salts, and Spirits, expand and dissolve the Contexture of the fibres which compose their sides. Whether the small Masses of Fluids inclosed be still formed into diverse lesser Bubbles, and they each expand by finer Juices within them, moved by the corpuscles of fire, as we see in boiling Water, or by the Insinuation of the corpuscles of fire between the Sides of the corpuscles of the Fluid, or by the Springs

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given

* It is for this Purpose, that in us and all Animals, the Juices which help in Digestion are endued with a saponaceous Quality, as the Saliva, gastric Humour, pancreatick Juice; both Galls, and the Juices of all the intestinal Glands; and to this chiefly that Homogeneity of Parts in Chyle and Milk, &c. is owing, which always appears in sound Animals, tho' they are prepared from Meals made up of Things naturally, absolutely immiscible with each other.

given by corpuscles divided, or by the Extension of corpuscles which were bent and compressed; it is certain that phlegmy Liquor, or a Mash, wherein small Masses of fluids are so involved or enclosed, will bubble most, rise the quickest and highest in boiling, expand soonest, and most in fermentation, &c. And the inclosed Juices are divided into Steam before that which encloses them, bursts. And the Stomachs and Guts that are full of Phlegm are generally most extended.

A Brewer's Vessel, called a Back, containing thirty Barrels full of Liquor made of Malt, but more especially of Molossus, which they call Wash, and one Barrel of Barm mixed in it, will in 24 Hours begin to ferment, and sometimes keep an Head of Barm, become warm as Milk when milked, and so continue for a Week. And sometimes in 24 Hours make a break at one End, boil, roll, or move in the same manner, and with near the same Velocity as Liquor in the Salt or Allum Pans does, or this Liquor would do with a moderate fire, and will continue to roll or boil so for 14 Days together, and will not come to any considerable Degree of Warmness. They never beat in it, but let it take its own Course
till

till it cease Working, and be freed and fit to distill for Spirits. The Wash of different Sorts of Malt hisses, and makes an extraordinary Bustle.

So if one eat and drink 30 Ounces, one Ounce of Juices secreted out of the Glands into the Stomach, may be sufficient to ferment the whole, tho' it be no stronger than Barm, and if the Stomach were not close, nor kept so warm nor moved. Barm appears like Phlegm, and whether it be a phlegmy or thin Juice, or both that operates in the Stomach, and whether Phlegm will ferment Wort, deserves to be observed.

The force of infinitely small Agents is to be computed by their infinite Number, for that which will be lifted or split by one Agent, whose force is equal to a Pound Weight, can be lifted or split by the force of 000000 of Agents, each of whose force is not equal to the Part of the Weight of a Grain. And also by their infinite Sharpness, and Smallness, for dividing the Corpuscles of Bodies, and by their infinite Quickness in repeating their Strokes.

To make this short and intelligible, 'tis necessary to give Definitions of a few Things which are often named.

C H A P.

C H A P. V.

A Definition of Steam, and an Account of its various Qualities, Abilities, &c.

Vid. p. 20
of Salts.

STEAM may be accounted a mixt fluid. It is a vast Number of small Masses at small Distances one from another, composed of Corpuscles of Fire, or volatile Salts, or Air put into Motion by the Gravities of other Bodies or Fluids, or some other Impulse joined to, sheathed in, or entangled with Corpuscles of other fluids or Matter so small or light, and so figured, that the Masses or several Corpuscles of different Matter so joined together, rise thro' Fluids, some Distance into the Air, like Corpuscles of fire mixed with those of light dry Matter, which we call Sparks. When there are vast Numbers of such successively raised and hindered from ascending upward, they may successively by their Motion, Rebounds, and Elasticity impell one another through the Fluid in any Direction, and jointly impell what they meet with in their Passage. When they come to Corpuscles of Cold, these Corpuscles adhere to the Masses,
over-

overload the Agents, and they and their Burthens fall. Their burthens collected, form a fluid, and the Agents by Degrees go off freed, with smaller burthens, or perhaps some of them lie entangled in the fluid. If these Agents were not framed to entangle with other Matter, 'tis likely, they are so small, they might pass without moving a fluid, and they move faster or slower in Proportion to their burthens. Whether the Agents in each Mass keep the same burthen which they take in the Stomach or Guts, and carry it through the blood to the Passes in the Lungs, or the capillary Vessels, or Pores in the Skin, where the Cold clogs them, or they get out; or whether they change burthens in their Passage, and one take another's burthen, is not material. When these Agents go off alone, they are invisible, like Corpuscles of fire diffused; but when they go loaded in any considerable Number, near together, they form a visible fume like Smoke. In Winter, when the Air is cool, it condenses the Steam issued out of the Lungs into Masses so large that they are visible. In Summer, when the Air is hot, it keeps them more divided, and more invisible. * That
Steam

* Vid. *Mart. Lister Dissertat. de Humor*, p. 76. *Amstelred*, 1711.

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Steam we discharge backward, commonly called Wind, they say will Fire at a Candle like the most volatile Spirits. When these Agents are entangled, or sheathed in Matter, whose Corpuscles will not divide, or not divide small enough or light enough, for them to bear off, they are inactive like latent Corpuscles of Fire, &c. That Steam which is so much loaded, that it goes not off briskly we call Wind. * All Fluids, except Air, will fall through Steam, though never so strong, and the Steam will give little Resistance, but when Steam issues and takes its Course through a small Tube, like a Flue to a furnace, it will resist any fluid, and repel it according to the Degree of its Impulse or successive Motion. When the Masses of the Steam are kept warm in a fluid, they keep separate, and insinuate and mix themselves in it, till the Supply cease, or the fluid cool, or the Agents go off, or be overloaded. When they are condensed alone, they form a thin Fluid. I know it is a common Notion that it is Wind or Air which extends the Stomach and Guts, but 'tis certain there can no such Quantity come there at once. There doubtless

* And causes that uneasy Distension in the Bowels, we commonly say arises from Wind.

less does some small Quantity go with our Meat and Drink, and that if collected, would make a Stop in any Passage of the Body, because it will not pervade a Fluid alone; but when mixt with Corpuscles of Fire, small Salts, and Fluids it will pass any fluid in any Direction. The raising and bearing off Corpuscles of Solids in Steam, will not seem strange if we consider the smallness of the Corpuscles of Gold that can guild the Surface of 1000 of Yards of Silver Wire; * and how much smaller the Corpuscles of Vegetables, and Fluids may be. † Or if you place a burning Candle near a smooth Body, and between it and the Sun, when it shines clear, you may see with how great Velocity a prodigious Number of Corpuscles issue from the Candle. Steam will be compressed or expanded, when contained in any thing which can be extended, and contracted, as its Strength, or the Strength of that which compresses it, prevails. And the Strength of the Steam, in the Stomach and Guts, or in some one, or part of them, is always equal at the present Bent, to the Pressure of the Atmosphere,

* Vid. Boyle Exp. de Atmosf. Cap. 2. Lugd. Bat. 1676.

† Consider the Size of a Pumpkin, in Comparison of its Stalk, thro' which its whole Nourishment is conveyed.

mosphere, and the Resistance of the Muscles of the Belly, &c. because these are always acting against it.

'Tis possible to conceive, how a Fluid in a Pipe, with several Valves, &c. might be circulated by Steam, issued out of a Vessel into it, and the Compressure of the Air. But whether it be possible for Man to make the Parts so exact as to perform it, I cannot tell. If such a Pipe had an End fixed in the Side of a Vessel, which could be compressed, and would emit Steam into it, at a small Aperture, and at some Distance had a Valve in it, which that Steam would force open in a Second of Time, and at a little Distance beyond that another Valve, to open forward also, and the rest of the Pipe were filled with a Fluid, and were bended, and the other End were fixed into the Side of the Pipe, between the two Valves, immediately after the first, with a Valve to open into the Pipe, and the Pipe were defended from Cold, or Compressure between the Vessel and the Bend, and a Valve were placed at the Bend to open forward with a small Force, when the second Valve opened, and beyond that Valve the Steam should be condensed by Cold, and suffered to perspire by Pores, and
the

the Pipe compressed by the outward Air; the Force of the Steam would drive part of the Fluid beyond the Valve at the Bend, and its force would cease, and it waste there, and the Compressure upon the returned Part of the Pipe, would force Part of the Fluid through the Valve at the End of the Pipe, into the Part of the Pipe between the two first Valves, where it would find a sort of a Vacuum, or less Resistance, during the first Part of the Second of Time, after the Steam had passed the Valves, and before it had Time to be issued in sufficient Quantity to open the first Valve, and resist it: and that Vacuum would be somewhat enlarged by the Cold in the returning fluid, which would condense the Steam it should find there, and at the End of the Second of Time, the Steam would push through the first Valve, and Part of the Fluid, and itself, through the next two Valves, and beyond the Bend, so successively. If the Steam were not secreted out of the Pipe by Pores or some other Way, as 'tis out of Animals by their Lungs, Pores, Ureters, &c. the Steam would encrease the Fluid, fill the Pipe, and hinder the Circulation.

C H A P. VI.

Concern-
ing the
Agents.

The Agents assigned, which circulate the Blood, secrete the Juices, perspire and respire the Halitus, Sweat, &c. with the Reasons for assigning them, confirmed by Observations, Reflections and Deductions.

THAT the Blood in Animals circulates, and along with it, what enters into it, through the lacteal Vessels, till Part thereof be respired, perspired, secreted by Urine, and Part be converted into Blood, Flesh, Bones, &c. is now taken for granted. That it requires a very great Force to circulate it, is demonstrable. That several, who have attempted to shew what circulates it, have ascribed Powers or Faculties to Parts of our Bodies which they have not, and Actions which they are not capable of performing, few People doubt. That our Growth, Life, and Action depend upon that Circulation, or upon something secreted out of the Blood by that Circulation, and that most of our Disorders are occasioned by, and attended with unequal, and

and disorderly Circulation, is very certain. That till the Cause of this Circulation be ^{Of Disorder} known, 'tis likely the Remedies will be ^{ders} uncertain; and though I profess no Knowledge in Physick or Anatomy, I have employed some Thoughts about natural and mechanical Operations, and the allowed Apology (for the Good of Mankind) will excuse me for offering my Thoughts upon this nice Subject, tho' they be not altogether right.

That which is called the Circulation of ^{Of the Cir-} the Blood, I take to be two contrary Mo- ^{culatation of} tions, one going from the Heart along the ^{the Blood;} Arteries to the extreme Parts of the Lungs, ^{and the} Externals, and Intestines, and the other ^{Causes of} returning through the Veins to the Heart, ^{it} Which two Motions, I think, are performed by two different Agents, the one within the Body, and the other without the Body.

The first, I think, is performed by the ^{The first} Steam raised out of the Meat, Drink, and ^{Agent as-} Juices in the Stomach and Guts; which, ^{signed,} as it rarifies and expands, issues by the ^{which} joint force of the Pressure of the Atmo- ^{drives the} sphere, and its own Expansion, from the ^{Blood from} Stomach and all Parts of the Guts, thro' ^{the Heart} the lacteal Vessels into the *Receptaculum* ^{thro' all} *Chyli*, and thence through the Chyle Duct ^{the Body.}

into the * upper Part of the *Vena Cava*, and so forward through the right Ventricle of the Heart, thence into the Lungs, where the Superfluity of it is discharged, thence through the left Ventricle of the Heart, thence into the great Artery, thence into the lesser Arteries, to the extreme Parts of the Body, and of the Parts which serve for Secretion or Discharge, where the Remainder of the said Steam condenses or perspires.

The second Agent which returns it to the Heart from the whole Body.

The second (I think) is performed by the Pressure of the Atmosphere, which forces the Blood up the smaller Veins, into the upper and lower Parts of the *Vena Cava*, to the Place where they unite, at the right Auricle of the Heart, where the Steam issued at the inosculation of the Chyle Duct, into the Subclavian Vein, which is at the upper Part of the *Vena Cava* near the Heart, takes it.

The Use of the Heart.

The Heart, I think, uses not, nor has any great Force to push the Blood forward, but is placed for a Check or Stop: The right Auricle and Ventricle to the Steam and Blood, issued from the *Vena Cava*, and the left to the Blood, and Remainder of the Steam issued from the Veins

* Or thus, Into the subclavian Vein, and so to the right Auricle, hence thro' the right Ventricle, into the Lungs.

Veins in the Lungs. And its Valves are so contrived; those, from the Veins to open inward; and those, into the Arteries, to open outward, and shut the contrary Way: That as the Mixture of Steam and Blood presses out of the Veins, * it opens the Valves into each Ventricle, fills the Ventricles, extends them, opens the Valves into the Arteries, and pushes forward, whereby the Force of the Steam behind is spent, so that the Valves from the Veins shut, and the Motion of the Blood in the Ventricles is continued forward, and the Heart emptied jointly by the Elasticity of the Steam, the Compression of the Atmosphere, and the Contraction of the Muscles of the Heart; and so successively make a sort of Space or Vacuum, in each Ventricle, at once for the Blood to flow from the Veins, and the Steam from the Guts. * And it seems, that the Strength of the Steam in its

D 2

common

* Thro' the Auricles, it opens the Valves into each Ventricle, fills and extends them, and pushes forward thro' the Valves of the great Artery, and thus the Blood is brought to the Heart; and it is emptied jointly by the Elasticity of the Steam, the Compression of the Atmosphere, and the Contraction of its own muscular Fibres; and so by a continual Evacuation of the Ventricles, a Sort of Vacuum or Space is found for the succeeding Blood and Steam, ready to pour itself in at the right Auricle from the *Vena Cava*, the Resistance before it being removed.

common Course, and that of the Valves, are so proportioned, that the Steam which rises in a Second of Time is necessary to open them, and when that, and the Blood has got Vent forward, they will shut, and continue so, till the Force of the Steam constantly issued from the Guts, and stopped at the Heart, in the next Second of Time, rise to the same Degree. If there were not such a Stop, the Steam would hurry the Blood forward, as long as its Force lasted. The Force of the Steam would always be equal, and that which it has now, would (if not stopped) not move the Blood a Minute; or if it were strong enough to move it continually, it would move as quick as Lightning: * but by its Stops, the Force of the Steam.

* To illustrate this, you will find a very remarkable Passage in *Hippoc.* See *Lud. Duret*: *Comm.* in *Coac. Hipp.* Sect. 32. The learned *Boerhaave*, in his *Aphor. Cap. de Peripneumonia vera*, quotes the very Words, Numb. 848, viz. "If the whole Lungs, together with the Heart, be inflamed, the Heart falls from its Place to a Side, the Patient is struck with a Paraplegy, becomes cold and insensible, and dies the second or third Day." His accurate Commentator *Van Swieten*, in *Tom. II.* p. 767-8, endeavours to explain this Phenomenon by the received Theory, and adds, "That it seems wonderful *Hippocrates* should be able to make this Remark, unless he had known the present Laws of Circulation, or had learn'd it from the Inspection of Bodies dead of this Disease." 'Tis most likely he had it from the latter, for by the former it is absolutely

Steam is encreased, the superfluous Steam is forced to secrete out of the Lungs, and the Motion of the Blood is regulated to the Quantity the Cavity of the left Ventricle

ly inexplicable; or the divine old Man must have had a true Idea of the Cause of so rapid a Circulation, which easily evinces the Possibility of such an Exit; nay, demonstrates that no other could happen; nor would he so often surprise us with the Nature of his Predictions, as well as the Truth of them, if we would but consider him in his own Sense, and not endeavour to make our Theory his Test; whereas his own in most Points, perhaps is better; this Particular, as well as many more Symptoms in peripneumonick Cases, as set down by Hipp. I say, shews that when the Agents of the Blood are agitated to the utmost, the Blood is capable even of displacing the Heart, which I think much easier to conceive, than that the Heart by its own increased Motion shall agitate the Mass in such an extraordinary manner, and even overturn itself. Besides, by the rest of the Symptoms which precede Death in this and most acute Disorders, it is highly probable; nay, perhaps demonstrable, that the left Ventricle of the Heart must be for some time, either entirely motionless, or at least, transmit little or no Blood to the *Aorta*; &c. so the Motion of the Blood be only thro' the right to the Lungs; Vid. *Boerhaave* as above, where he says, Death happens to them when the Pulse fails, and all the Parts are cold, save the Breast, Head, and Neck, which burn with Heat; the Cheeks are intensively livid; these Parts now are all within the Effect of the Circulation; the rest, which depend upon the Motion thro' the left Ventricle, are cold and benumb'd. Hence it is evident, in most acute Cases the Heart is not able to withstand the Torrent, much less can it with any Propriety be thought its sole Mover.

This innate, self-sufficient Agency of the Heart, (than which nothing can be more unphilosophical or absurd) being a received Opinion, and taught in all Schools now a-Days, has been the only Cause of so little real Use having been made of the illustrious *Harvey's* Motion of the Blood;

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tricle of the Heart sends forth at each Push. Of what Use the Water is which environs the Heart, whether it be only to facilitate its Motion by keeping off the Pressure of the Atmosphere, and preventing Friction, or to condense the Steam at its first Approach, and preserve a Vacuum till it be filled with Blood, or for what other Use, deserves to be considered. * When the Ends of the *Vena Cava* and Heart are distended with Steam and Blood, the Heart will be lifted up, and when the Steam and Blood pass thro', and the Ends of the *Vena Cava* and Heart are relaxed, the Heart will fall down,

Blood ; it hath hoodwinked us from the Beginning. Pleased with the Discovery of the Blood's Motion to and from it. We immediately dubbed this with the Name of Agent, which in reality is only a Curb upon the Agent, and had we not too slightly run over the great Inventor's Account, we never could have been guilty of so foul an Error, for he expressly says the contrary, *Exercitat. Anat.* p. 191. *Lond.* 1661. and this he is induced to say from Exp. which he shall hereafter publish, but the Loss of these Pieces are among the other irreparable ones we feel at this Day, from the Confusion of those Times. To see how far this great Man's *Humid and Primæ*. agree with our Author's Steam, I think it worth any curious Man's Time to consult his Book *De Generat. Animal.* p. 483. Edit. Elzev. 1641.

* When the right Auricle and Ventricle are distended with Steam and Blood, the Heart will be lifted up, or shortened, and when the Steam and Blood pass thro', the Heart falls down, or is lengthened, besides, &c.

down, besides what Motion it has by being extended and contracted. As the Steam and Blood pass along the Arteries by Pushes, they fill and raise the Arteries, and in the Intervals they relax and fall down. These Motions are augmented by the Expansion of the Steam in the Heart and Arteries, where the Pressure of the Air and Cold is mostly kept off.

The Strength of the Air-bladders of the Lungs are so proportioned, that any Force, beyond what is necessary to drive the Blood along the Arteries, opens the Passages into them. And the Steam, which, if it should all pass through the left Ventricle of the Heart, would drive the Blood too fast along the Arteries, and extend them too much, opens the Passages out of the Blood Vessels, and drives Part of itself into these Bladders, and vents itself there. When they are a little extended, the Air presses in; and its Force, being augmented by Motion, extends the Lungs farther, partly into the Vacancy in the Chest, (if there be any) and partly into the space possessed by the Stomach and Guts, and extends the Rind of the lower Belly outward. When that Air is mixed with Heat, Steam, &c. expanded and lighter than the outward Air, the

Pressure of the outward Air upon the lower Belly, and its own Elasticity, perhaps, assisted something by the Contraction of the Lungs, drives it out, and so it partly condenses the Steam, and partly gives it Vent. And the Pressure of the Air upon the lower Belly, notwithstanding the Secretion of the Steam, and the Expansion of the Bladders, has the same Effect in some Degree, upon the Blood in the Veins of the Lungs, as it has upon the outward Veins; and the Remainder of the Steam supplies its Defect, and perhaps there may be Valves upon the Vessels, where the Blood, and Steam, or Chyle meet, and even upon the most capillary, where the Blood goes out of the Arteries into the Veins; but if there be, I think, they only contribute to hinder the Fluid from returning backward, and so direct the Force.

CHAP. VII.

The following Observations and Deductions, induce me to believe, that those two Agents are of that Force, which is necessary to circulate the Blood, and that those Agents employ their Force to perform that Operation.

THE Force of Steam, every one knows, is in Proportion to its Refraction or Expansion, and if it were proved how far each spoonful of Liquor with a little Air, may be expanded by that Degree of Fermentation and Heat, which is in an healthful Body, it would seem prodigious, and the Agent, not insufficient for the Task assigned. The Force of the Pressure of the Atmosphere is sufficiently proved, and its Strength is certainly known, and I hope it will be allowed sufficient for the Task I assign it, if it appear, it employs its Force therein.

The two Agents capable of the Powers ascribed to them; and that they are the real ones.

'Tis evident, that such a Mixture of Solids and Fluids, as is constantly supplied into our Stomachs, kept warm, and defended from the Air, as that in our stomachs

machs and Guts is, and kept in Agitation, as that is by the Motion of the Lungs, Body, &c. would ferment and raise an hot Steam, extend the Vessel that contained it, or if there were long small Passages, issue out along them, till condensed by the Cold. Even the Excrements after they are discharged, ferment in the Dunghill, grow hot, and send out a strong Steam visible to the Eye in cool Weather. That the Steam raised in the Stomach and Guts has no other Way to pass, except when it breaks upward or downward, but through the lacteal Vessels, and along with the Blood, by the Vent at the Lungs, out at the Pores, or, that which condenses, at the Ureters, is also evident.

That the Matter, which passes from the Guts into the Blood, passes in Halitus or Steam, is visible by the Straightness of the Passages through which it goes. That it passes with the Force assigned, is also demonstrable: For, it could neither pass through straight Passages, nor enter into the Blood, if its Force were not greater than that which drives the Blood thro' the Veins, towards the Heart: Otherwise that Force would drive the Blood and the Steam back through the
lacteal

lacteal Vessels into the Guts. If the Heart pumped the Blood outward, the Air must bring it back, or press upon it in returning. Hence the Force which makes the Chyle or Steam enter into the Blood, must be greater than the Pressure of the Air. If the Matter which passes the lacteal Vessels were more crude, or in larger Particles, it could not pass the capillary Vessels, nor circulate in the Blood, but would cause Stoppages and Swellings there. If they were much smaller, they would all go out at the Pores.

Steam defended from the Cold, confined, and successively impelled and augmented with new Supplies, will rise to a prodigious Force. But where that which confines it will be opened with a certain Force, and give it Vent, it can never rise to be much stronger than that Force. I mean the Steam which issues with the Chyle, through the lacteal Vessels, in a second of Time, is sufficient to open the Valves of the Heart, push about the Blood, and shift a certain Proportion into the Vessels compressed by the Atmosphere. And a Stop in the lacteal Vessels for a second of Time, would expand the Stomach and Guts, notwithstanding the Resistance

Resistance of the Air, Muscles of the Belly, &c.

Steam that both expands the Parts, drives the Blood, and issues out at the Pores, must be stronger than the Air, though the expansive or side-ways Motion, seems not to be much stronger, yet if a Pipe with a Fluid in the Middle, and each End empty, and the sides too strong to be compressed by the outward Air, were to have an Aperture of equal Dimension at each End, and one End fixed in a Vessel which would emit Steam in the same Quantity, and with the same Force as the Guts, and the Air were let in at the opposite Aperture both at the same Time, the Air would push in with great Force, and 'tis likely prevail against the Steam, and push the Fluid forward: But the Steam stopped, and not condensed, would augment its Force as more Supply issued, and prevail. And as the Pressure of the Air would not encrease, the Steam would drive it and the Fluid, out at the Aperture where the Air came in. The Air is not any way fit for Circulation, because it would not waste, nor condense, nor issue at the Pores, against its own Pressure; so after the Fluid were once pushed, the Pipe would be filled with

The Air
not a fit
Agent to
circulate
the Blood.

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with Fluid and Air, and would stand still, the outward and inward Force being equal. Nor would the Air mix with the Fluid, and go along with it as Steam does, but the fore-end would be full of the Fluid, and the hinder-end full of Air.

If the Agents that move the Blood, did not go along with the Blood, and were not extended all over the Body, there must be one Part, suppose the Heart, of sufficient Strength to move all the Blood in the Body, and the Heart must move of itself, or be moved by some stronger Agent. If several Parts acted jointly, the Case would be the same.

I think the expansive Force of the Steam within a Man in perfect Health, is nearly equal to, but something stronger than the Pressure of the Atmosphere in fair, clear Weather; because he is not sensible in any Part of the Pressure of the Atmosphere. I know the Reason commonly assigned is, because it presses equally on all the outward Parts; but that will appear not sufficient; for if there were not a Resistance within, it would compress our Bellies close up to our Backs, till the Strength of the Muscles could stop it, or till no Space remained, but what were filled with Fluids or Solids, and it would

The Blood could not move without the Agents going along with it.

The Steam in a healthy Man stronger than the Pressure of the Atmosphere.

would press the Fluids even up to our Mouths, &c. as the additional Pressure of Water does when one goes down to any considerable Depth. Whereas on the contrary, we see something within can distend our Bellies to a great Degree, notwithstanding the Resistance of the Pressure of the Air, and that of the Muscles of the Belly, nay even against an additional Pressure of several Fathoms of Water. And if the Mouth and Nose be stopped, so that the Steam cannot issue out at the Lungs, notwithstanding the Emission of the Steam at the Pores, and the Pressure of the Atmosphere, the Parts will all extend, and soon put an End to Circulation and Motion. When the steam is very gross, so that it goes off slowly, the Pulse moves slowly ; and the more 'tis pent in, the more the Guts will extend.

When the Pressure of the outward Air is taken off an Animal in the Air-Pump, Steam distends, and would burst the Body, if the Pores did not vent it. But if the Blood were circulated by the Force of the Heart, it would have no such Effect : For if the Heart pumped the Blood with never so great Force, the Arteries must still be full, and it could pump the Blood
into

into them no faster than the Veins supplied it, and the inward Parts, where the Force was greatest, would be most extended. I believe, if an Animal had the Pressure of the Air taken off its Body, and had Liberty to draw Air into the Lungs, and respire it; (if Respiration could be performed when the Air is kept off the Outside,) the Steam would go a great way towards bursting the Blood-Vessels. And I presume, most of the Blood in a Creature killed in an Air-Pump, by taking out the Air, would be found in the outward Parts, and I should be glad to see how it would, whilst alive, and the Air was taken off, bleed at a Vein, and how at an Artery, and how when more than the ordinary Air is pumped in. And if the Pressure of the Air were kept off the lower Belly, I should be glad to see how the Lungs would respire: For I think, when the Steam within prevails, it forces a great Part of the Blood into the outward Parts, and distends those Vessels, and when the Pressure of the Air or Cold prevails, they force a greater Share of the Blood into the inward Parts. And as the Lungs are so contrived, that they cannot emit, or vent the Steam, without Air, when the air is kept off, or hindered from
entering

entering at the Nose or Mouth, for want of Discharge, the Steam prevails, distends the Parts, &c. so if the Air were kept off the Outside of the Body, and admitted into the Lungs, and extended the Bladders, and admitted as much Steam as its Intervals could receive, * and if the Muscles of the Lungs, and the Elasticity of the Air filled with Steam, could successfully respire it, I believe the Steam would force most of the Blood into the Veins, and fill the Arteries with Steam, and the Blood * would not return out of the Veins to the Heart, for want of the Pressure of the Air: For the Blood moves equally in the Veins, and is not governed by the Pulses of the Heart, neither in its Passage, nor when a Vein is opened.

Abundance of Observations and Proofs might be made about Circulation, Respiration, &c. If a Man were put into a large Vessel made close of Lead or Brass, with an Air-Pump fixed in it to draw out, or Pump in the Air, so long as he could endure it, and by fixing a Pipe thro' the Side, to keep close in his Mouth, to draw in,

* Or thus, If in this Condition Respiration could be carried on, I believe the Steam would force most of the Blood into the Veins, and leave the Arteries empty; and the Blood, &c.

in, and respire the Air. And perhaps many Diseases might be cured by strengthening or weakening the Pressure of the Air, which environ'd his Body.

In Proportion to the Increase of the Quantity of Steam emitted from the Stomach and Guts, whether by too great a Ferment of the Juices there, as in a Fever, or by too much spirituous Liquor, or violent Exercise, the Blood moves quicker, and all the Vents, as the Lungs, Pores, &c. emit greater Quantities of that Steam; especially in violent Action, the Lungs quicken their Motion, in Proportion to the Motion of the Heart, and slacken as that Steam abates or wastes; and in Proportion to the Degree of Expansion, or Quantity of the Steam, the Lungs are expanded more or less, and admit greater or lesser Quantities of Air at once; and also admit it oftener, or seldomer, or quicker, or slower. And though you can admit and discharge it quicker and slower voluntarily, yet if you do it quicker, and do not at the same time use Action to make the Steam rise, your Strength will soon be spent, so that you cannot continue it. Outward Cold shuts the Pores, and by preserving, encreases the Force of the Steam. But if the outward Cold thicken

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the Juices in the Pores and capillary Vessels too much, and shut them so close, that the Steam cannot get out of the outward Parts, they will turn red and swell.

See p. 34. And the Coolness of the Air, contributes something towards the condensing the Steam in the Lungs, or admits a greater Quantity of Heat into its Vacancy, for otherwise hot Air might bring off as much Moisture as cool Air. Nay, when the Ferment is very violent, the Steam drives too crass Matter into the Blood, and almost all the liquid Part out of the Blood-Vessels, and leaves little, but this crass Matter there, and the gummy Part of the Blood, which cannot perspire nor secrete, and a great Part of that almost as tough as Turpentine; so that it cannot pass the capillary Vessels, but causes Pain, Swelling, &c. and when the Steam is too weak, it will carry too little, and not make the Blood move fast enough. And though we have Power to stop the Motion of the Lungs for a short Time, and by keeping the Air in them for that Time, become stronger, or to use them for Speech, &c. yet I think the Motion of both the Lungs and the Heart are involuntary, and forced by the continual Succession of the Steam. And I think,

if

if the Stomach, or upper Part of the Guts were pricked, and so much of the Steam is then let out, that there should not go sufficient through the lacteal Vessels to force the Blood, or if the Ducts for the Steam or the lacteal Vessels, were stopped or cut, Circulation and Respiration would be that Moment at a stand, and the Air would press the greatest Part of the Blood into the Trunk. Perhaps if the Steam press too hard, the Blood will not succeed in due Proportion. And if the Force of the Steam which drives what they call the Chyle, or indeed which drives itself, were not equal, or rather superior, to that Force which drives the Blood from the Veins, in the outward Parts to the Heart, the Chyle and Steam could not pass into the Blood. When I name equal Force, I suppose, to open the Valves out of the Chyle Duct into the *Vena Cava*, the Steam by being stopped there, and new Steam succeeding, must, though in a longer Time, be equal at certain Periods of Time, to the Force of the Blood which resists, and shuts the Valves when it opens them. And as the Steam governs the Motion of the Blood, Nature has contrived the Causes which raise that Ferment which produces it, in such a man-

ner, that the more the Steam has to do, the more it encreases, and the stronger or sharper it grows: For as Exercise wastes the Steam, and at the same time requires Supplies of it, and Nourishment in it, it encreases the Fermentation in the Stomach and Guts, which send off those Supplies. If Obstructions in the Vessels, or the Viscousness of the Blood hinder its going off, its Quantity and Heat being pent within, still raises the Fermentation, and subtilizes or attenuates the Matter, and hinders the Excrements from going off by Stool, till the Steam remove those Obstructions, * and make the Blood move, or till so much of the sharp Spirits or Salts are freed and raised, as to cut the Viscousness of the Blood; and as soon as the Steam has free Passage, the Fermentation by Degrees abates: If the Steam did not successively melt, expand or thin the Blood, by mixing with it in the Arteries, as it returns cooled and thick out of the Veins, no Force whatever could circulate it, nor any crass Matter could ever be secreted out of it.

How

* And make a brisk Circulation. This is the true Doctrine of incising and attenuating, for as soon as it has free Passage, &c.

How this Fermentation was at first set forward in created Man, whether this be that Breath of Life breathed into him; or whether those Words meant the Soul; or what else, I undertake not to determine. But 'tis not difficult to conceive, how by Degrees, this Fermentation may be set forward in the Stomach of an Infant in the Womb: For allow it be supplied at the Navel, by the Blood of the Mother, something must either pass in at the Mouth, or be secreted at the Glands into the Stomach, whereby the Stomach and Guts must be kept distended, or else they would be found lank, and the Case of the Belly straitened or contracted. And if there be any Thing issued into the Stomach, that raised into Steam can push the Blood outward, the Compressure of the Womb, will supply the Use of that of the Atmosphere, to return the Blood inward. If Nature has contrived Apertures out of the Blood-Vessels into the Stomach, 'tis likely they make Secretions into the Stomach; when the Force of the Steam grows weaker there, than the Force of the Pressure of the Atmosphere, whether those Apertures are designed to secrete Matter thither to keep in the Fire, and preserve Life when the Steam is most-

ly spent; or the Fluids mostly driven out, or to liquefy the Meat, and digest it in Defect of Drink, as the Crops of Birds do to the Corn there, or to secrete Matter so crass or so stitious, that cannot be discharged outward, or any other Way, or to raise a Fermentation, or to assist in the Dissolution of the Aliment, or to reduce Matter to be farther prepared by several Operations in the Stomach, till it be fit for nourishing the Parts, supplying the necessary Juices, or to what other Uses, these and the Secretions made into the several Parts of the Guts are designed, will hereafter be considered.

C H A P. VIII.

The Contrivance of the Frame, and Disposition of the Parts of our Bodies, fitted for such Motion by these Agents.

THE Lungs and Heart, are cased round with an Arch of Bones, on the upper Side, and outwardly; with the Midriff on the lower Side, inwardly; to keep off Cold, or the Pressure of the Atmosphere, which would stop all; if they could either cool or compress them too much.

much. The Stomach and Guts are pressed by the Atmosphere without, and by the Extension of the Lungs, and Depression of the Midriff or Diaphragm within, which assists the Force of the Steam, which issues out of them into the Trunk. And the Arteries which bring the Blood outward, are all defended from the Pressure or Coolness of the Air, the great ones within the Trunk, the lesser with Flesh. The Blood mixed with Steam, runs very thin, and freely in them, because it is not liable to be condensed; and as they advance to the outward Parts, they are divided and branched smaller and smaller, so that the Blood comes to the Surface through infinitely small, capillary Vessels, so small, that the Strength of the Skin is sufficient to keep off the Pressure and Coolness of the Air, and its Pores stop the Blood, and only suffers the Steam to pervade it. When the Steam has done its Office, and the Blood is admitted at such like small Apertures into the Veins, which lie near the Surface of the Body, it will be compressed by the Atmosphere equally in all Parts, which will make the Blood flow that Way, where it meets with least Resistance, which is towards the Heart, because each Aperture of the Val-

See p. 51.

ves, or Push of the Steam through the Heart, makes a sort of Vacuum; and the Veins are widest that Way, and there is less Pressure upon the Veins in the Trunk, and perhaps there may remain some small Force of the Motion, by Pushes outward from the Heart beyond the Returns, to further it that Way. The Vessels in the highest Part or Head, whether the finest of the Steam, and the purest of the Blood, most naturally tends, and where it would in any violent Emission, be in most Danger of bursting the capillary Vessels, and where Nature employs the Steam the most, all the Senses being seated there, are environed with a Case of Bone, to keep off the Pressure of the Atmosphere, and prevent those Vessels bursting outward, to prevent the Steam from perspiring, and secrete it for its proper Uses into the Nerves; and those Nerves are continued along the inward Parts, and branched out as the Arteries are, where the Pressure of the Air cannot hinder the Steam from passing the Nerves, whether they be Tubes, or porous by compressing them, or condensing the Steam till it has extended the Muscles, or be perspired at the Organs of Sense, or Pores of the Nerves. When the Steam arises in too great

great Quantity thither, or perhaps when 'tis too-subtile, so that too much of it secretes there, all our Senses are at a Stop, or disordered. * The two great Discharges are downward, and within the Body, so that the Air by its Pressure or Coolness can condense the Steam; but not hinder its Operation. The Sides of the Trunk of the Body, are compressed, or squeezed by the Air without, and the Steam in the Stomach, Guts, &c. within. And as the Air prevails, the Steam is pressed into less space, the Parts contracted, and the Juices are pressed inward; ~~but~~ the Steam prevails, it expands, the Vessels are extended, and the Juices are pressed outward. Every Part or Member of the Body, consisting of Bone environed with Flesh, and Skin, composed of Arteries, Veins, hollow Tubes, is pressed by the Air without against the Bone, and by the Steam in the Arteries, Veins and Tubes, as it circulates the Blood and Juices, by its expansive Force, or sideways Motion against the Bone inward, and against the Air outward. The Insides
of

* Perspiration which is generally looked upon as the most considerable Discharge, is by our Author all along understood by the Evacuation of the overplus Steam, and then there are only the two great Discharges remaining.

of the Trunk, and Outfides of the Stomach, Guts, Liver, Milt, Kidneys, Midriff, Card, Mesentery, and Bladder, &c. are compressed one against another, by the Steam within and Air without; and their Out-Coats are so close, that in healthy Persons they either emit nothing, or what one emits, others admit. When the Steam extends the Stomach and Guts in all Parts, little is returned into any of them. But when the Steam in any Part between stop and stop, or Valve and Valve is wasted, the Valves shut, the Part contracts, and the Steam issues from the other Parts; Juices are pressed by the Air and Steam, into the Glands in that Part, to be ready to issue into it to begin a new Ferment, or, &c. That the inward Parts always fill the Cavities of the upper and lower Division in the Trunk, and press against one another, with as great, or a greater Pressure, than that of the Air, is evident; for considering how pliable or flexible the Guts full of Fluids and Steam are, when there is a small Aperture made in the Case or Rind of the lower Belly, they could not push out, if there were any Space void within, and if that which expands them were not stronger

stronger than the Pressure of the Air: And when the Lungs expand, press the Guts, and by them extend the Rind of the Belly, if there were any void Space they would press into it, before they could stretch the lower Belly against the Strength of its Muscles, and the Pressure of the Air. Nor could the Pressure of the Air upon the lower Belly, press back the Lungs into their first Space, so long as there were any space empty in the lower Division, and the Steam has the like expansive Force in Proportion to its Quantity, in every Artery or Tube in the Body; so that every one, strong or weak, is supported by the others next adjoining, from extending out of Course, or bursting. If more Ribs, or a Case or Frame of Bones, had included or surrounded the lower Belly, the Circulation of the Blood, and the Vibration of the Lungs, could neither of them have been performed; for the Steam must continually have been so strong, as to have kept the Place allowed it, in the Case full; and pressed the rest with Force equal to the Pressure of the Air, and its own expansive Force, that is, so much above the common Pressure or Resistance of the Air upon the Blood-Vessels, as should have been sufficient

This is evident in all Ruptures.

cient to have overcome that Force, and have circulated the Blood, which would have prevented any Blood from entering into the Intestines, and then the Stomach and Guts could not have been moved by the Lungs, nor have emptied and discharged the Excrements, nor could the Lungs have had Liberty to vibrate in. But by the Pliableness of the lower Belly, the Lungs play, and the Stomach and Guts are moved, and kept compressed close, according to the different Extents of the Steam. And the Pressure, the Air has at each Time, lies equally upon the Stomach and Guts, to assist in driving the Steam, as lies upon the Blood Vessels to obstruct its Circulation, and the expansive Force of the Steam casts the balance, and moves the Blood faster or slower, in Proportion to the Difference of its Strength, &c.

There is a twofold Force, or two Forces joined, which act in driving and pressing the Steam out of the Stomach and Guts, and but one of those Forces in obstructing it, and the Blood, which it drives; and that much lessened by the expansive Power of the Steam in the Arteries and Veins, whereby the Blood is not only thinned, but those Vessels or Pipes

Pipes kept open, or their Sides extended outward, without obstructing the Blood, which Air, nor no other Agent could do. This eludes all the Computations which have been made of the Resistance by the Pressure of the Air upon the Body, and the Friction the Blood and Juices suffer, and the Stops and Interruptions they meet with by Valves, Strainers, &c. in the Blood-vessels. The Power of this expansive Force of Steam, has been proved to be very great in other Instances, but has never been computed or measured in the Stomach; nor have I had sufficient Opportunity to do it, neither to compute what Force Steam has upon warm Fluids, nor what Force it would have to be issued at one Aperture of a certain Diameter; nor as it is issued at infinite Numbers of small ones, neither singly, by its own expansive Force, without being compressed by the Air, nor jointly by that Force and the Compressure of the Atmosphere, so as to ascertain the force which is necessary to circulate the Blood, &c. The lacteal Vessels, Chyle Ducts, &c. through which the Steam passes to the Heart, are made fibrous, tough, and capable of being extended, and have Liberty, when the Steam is strong to extend. The Arteries,

teries, through which the Blood passes by Jirks, and which are mostly enclosed in solid Parts, are made of such a Texture that they cannot extend much, because that would evade the Force in the Motion of the Blood forward, and add incommodo the solid Parts. The Veins are made capable of being extended, and afford a greater Space for the Blood when it is expanded, which they being placed in the extreme Parts, mostly near the Surface, can do without Damage. Whether the Steam issues out into the lacteal Vessels in the same Manner as Water enters into the Bladder between the Guts, or those Vessels are placed in the Sides of the Guts; so that when the Steam is very strong, the Sides of the Guts may be extended, and the Inlets to the lacteal Vessels straightened, I am not certain.

There is never any Vacancy within, but what is filled with Solids, Fluids, or Steam, and the side of each Vessel presses upon the next, as when the Lungs are contracted, the Guts, Midriff and Bowels follow close, compress the Lungs, Midriff, and one another, as well when they are empty, or moving to and fro, as when they are extended, though not quite so much. The Case of the Breast and the

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the Milt, keep the Lungs from extending too far, or heaving, and makes them more the Stomach and Guts. The Liver lies on the right Side, I think, one Lobe on each side of the Stomach, and the Milt on the left Side; for the Stomach and Guts, when they are extended above the common Pressure of the Air, which returns the Blood from the lesser Parts through the Liver, will compress the Liver and Milt. The Heart as well as the rest is compressed, and moves mostly in the Fluid that inviscers it, and that Compressant assists the Extension of its Muscles to contract, and helps to empty the Ventricles, as the Air does in returning the Blood out of the Lungs, discharging the Breath, &c. and the inward Parts are not only limited from extending out of Course, but fixed by Ligaments from shifting out of their Places. When any of the inward Parts, the Stomach, Guts, lesser Vessels, or Ducts, are extended by the Strength of the Steam; the Steam if it passes freely, also extends the next adjacent Vessels and parts with the same Force, and their Sides support one another, so that the vacuum cannot be strained, except in an extraordinary Effort of Passion before the Steam get Vent, and as
soon

soon as it gets Vent, they are all safe. If the Resistance on the Sides of the small Tubes were taken off, such as the lacteal Vessels, &c. the inward Force would burst them. But as they all support one another with the same Force, they cannot extend out of compass, except in Fits, when the Steam vents not at the Lungs; * and when the Force that extends the Stomach and Guts, and drives the blood outward, is greater than the Pressure of the Air, the blood will not return fast enough, and the outward Vessels will be filled, and the Liver, &c. within, through which the blood returns, will be compressed. But the Stomach and Guts seldom extend very much, when the Steam drives the blood very briskly; because the Steam is then not too crass, so this can seldom happen except in violent Action; and perhaps the blood is most wanted without, then. The solid, or fibrous Parts or Vessels, which compose the body, have no Qualities in them, tending towards Motion, but Gravity, and perhaps not that neither; and are only moved, bended, contracted, or extended by the Motion of the Fluids; except when some
of

* Doth not this seem to account for the Jaundice, which often follows convulsive and hysterical Disorders?

of them are bended, they tend towards their former Figure by a small Degree of Elasticity, and what we ascribe to that, is frequently performed by Impulse from the Fluids within or adjoining. Nor have the Fluids, whose Corpustles are of equal Gravity, and like Figure, and have like Qualities, which do not ferment, or are not expanded, nor have Elasticity, any Qualities in them, tending towards Motion, but Gravity, and it is not certain that Gravity is inherent. There seems to be several Ways, whereby the Fluids move the solid Parts: First, the Parts wherein the Aliment is fermented, whose Sides are extended each, as the Ferment prevails against the Pressure of the Air without, and contracted as the Ferment abates, or is overcome by the Pressure of the Air. And there are Tubes and Ligaments framed in the Sides of those Parts, which are filled with Blood or Juices by Degrees, as the Resistance within abates, and keep the Cavity of the Vessel lessened, and the Sides contracted, till the Ferment encrease again in that Part, and the Juices be by Degrees discharged out of those small Tubes: And those Tubes and Ligaments have appeared, as if they had been the Agents which contracted, or extended

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Parts.

tended the Part; and there are such like Tubes in the Sides of the Blood-vessels, which when the Force which drives the blood is abated in any Part, fill and contract the Vessels in that Part, and keep them at that Extent, and empty when the Force is encreased there, and so seem as if they straightned or widened those Vessels by their own Power: so of the Lungs, and several other Parts, which are all performed by the Powers of Steam and Air, as each prevail upon, or in each Part, but most visibly in the Heart. Secondly, where some Parts are so composed of Tubes or bladders fixed to a Ligament, which, at the other End is fixed to a solid Part, that extending the bladders, shortens them, and draws the solid Part by the Ligament fixed to it, which is called voluntary Motion. Branches from the Arteries fill the Intestines, Muscles, &c. and branches of the Nerves fill them, with Steam from within, and branches from the Veins, fill them by the Pressure of the Air from without. The Force of the Steam must act upon the Arteries and Nerves outward, and the Pressure of the Air upon the Veins inward. The Action and Strength of the Muscles is compounded of the expansive
Force

Force and Strength of the Steam, which by the Arteries or Nerves, fill the Vessels which compose them within; and of the Compressure of the Atmosphere, which compresses and binds up the Outfides; and forces the blood and Juices inward, from the Veins and Glands, into the Vessels which compose them. * The Steam fills the Muscles, and by extending the bladders contracts the Part, then empties that Steam into the distending Muscles, or lets it go off, and fills the distending Muscle with other Steam, and the Air presses them to their first Figure when they are emptied. The Muscles are guarded by the Compressure of the Atmosphere from extending too far, or bursting, which they would be liable to, if it were taken off, and doubtless there are Vessels or Coats composed of small Vessels, which are filled with Juices by the Pressure of the Air, to resist and keep them from extending their bounds. The blood is not only of proper Consistence to be driven by the Steam, to convey Nourishment to each Part, to afford an infinite Number of various sorts of Juices,

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for

* Some Experiments about particular Effluvia from animal Bodies, seem to encourage this Hypothesis, and make it deserve a nicer Enquiry.

for the several Uses for each Part, and that fine Steam, they call Spirits, for the Use of the Nerves, to discharge the superfluous Parts at the Lungs, Pores, by Urine, &c. but perhaps also an Atmosphere for the Steam to work with, to extend the Parts by Explosion, as Fire does with Water; in the large Parts with common Blood, in the lesser Parts, the several Degrees of Juices secreted out of it. The Size, Number, or Thickness of the Muscles or Fibres, wherein it was supposed Strength for Motion consisted, is proportioned to the Strength of the Steam, and Juices necessary to contract, or draw the Parts which they are to act upon, or to resist the Force of the Steam, within the Part from extending too far, &c. these Parts have no active Power nor Force in themselves, so their Strength cannot be greater or less, by being either small or large, only where the Sides of a Tube, or Vessel, or Part is composed of a great Number of smaller Vessels, it is intended to contract forcibly. Every Tube in the Body which composes the Sides of any of the inward Vessels, that is, such as the Steam extends outward, is extended by the Fluids pressed into it by the outward Air, and by that means the Tubes which
compose

compose the Sides of the Heart, are continually kept full and extended by the Fluids so pressed into them; thence the Heart by the vast number of Tubes, arterial, venial, and muscular in its thick Sides, has continually a contractive Force, and would always remain strongly contracted, or with its Apertures closed, and its Sides together, if the force of the Steam did not alternately open it; and as that Strength is spent, it contracts: The Power or Force of the Contraction by the Pressure of the Air, is encreased by the Number of the Tubes or Vessels which compose the Sides of an inward Vessel, as well as its Cavity is more straightened by their Numbers being extended, by which means the several Juices, as Gall, pancreatick, &c. are pressed out. *Qu.* When the Resistance is weak within, and the solid Parts be moved, as I imagine, by these Agents, and after these Manners, will not this also clear the Uses of the several Parts, make Anatomy plain? Quit the Anatomists of seeking for solid Parts, to perform Motions which Fluids perform? for Muscles to open where the Part is only to contract? and to contract where they are only to open? and of that insuperable Difficulty, that the force given

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by.

by Muscles to the Heart, Brain, or any other Part, shall move all the other Parts

Lateral or and itself? *

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sages for

the Agents

necessary.

As the Arteries are branched out smaller and smaller from the Heart, and the Steam drives the Blood outward, the force of the blood issued out of an Artery into a Muscle, or Part to be extended from within, cannot be greater in Proportion to the Wideness of the Artery, than the Force with which it issues out at the Ends of the Arteries into the Veins at that Distance. And as the Veins from many small branches are collected into one before they reach the Heart, the force of the blood issued out of a Vein, to extend any Part or Muscle inward by the Pressure of the Air, cannot be greater, than the Stop it

* Among their imaginary Agents, there is one the most absurd of all, that is, the Contraction of the *Dura Mater*, this is called by *Hoffman* the Occasion of all convulsive Disorders; how this can possibly contract itself, I only appeal to any Body who has open'd the Head of a dead Person; for he must know its Adhesion to the Skull, even at the Top to be so strong as hardly to let the Skull be separated from it, and at the Bottom in the Inequality, to adhere so close, as to require the greatest Difficulty to separate it; but when an Hypothesis is to be supported, I am sorry to say it, it seems as if very little Regard were had to the Truth and Firmness of its Foundation, which in Physick must often be of very fatal Consequence; and I fancy every Body will condemn *Ludere cum Corio humano*, as well as *Ludere cum sacris*.

it meets with at its entring into the Heart, which is a full Stop, and an Outlet alternately; so there must be some side-way Vessels out of each into different Sets of Muscles, upon which these two Forces must act oppositely, or alternately; and 'tis likely there are Outlets out of the Nerves, through which the Steam issues, into each, or between the two, and acts upon the blood and Juices emitted into those Muscles, and either expands those Fluids, or inflates the infinite Numbers of small bladders, without venting, otherwise than by the Will, or slowly. Whether the Muscles are kept gently extended with Steam by the Nerves, and the blood be issued into it, or they be kept gently extended by the blood, and the Steam be issued into the blood, has not been clearly observed.

C H A P. IX.

Voluntary Motion, though not directed, yet perform'd by the same Agents.

PEOPLE ascribe all the voluntary ^{Animal} Operations of the body to something ^{Spirits and} they call animal Spirits, I suppose they ^{Steam the} same ^{thing.} mean infinitely small Particles of Matter,

such as can in an Instant pervade the blood, and pass along the Vessels from one Part to another. I confess I have no Notion of any other Spirits besides this Steam, which, I suppose, consists of Fire, Spirits, Salt, Air, Water, &c. That Degree of Heat, or the Corpuscles of Fire diffused at that Distance they are in our bodies, if they did not entangle with the Corpuscles of the Fluids, &c. in our bodies could contribute very little towards the Motion of blood or parts; because they would, immediately in Action, pervade all the Parts of our bodies, if they were much more bulky and solid than they are, and fly off. If the Corpuscles of the Agent, which extends the Muscles, were as small as those of Fire, they would pervade the Sides of the Tubes; if as sharp as those of Salts, they would wound and cut the Parts, considering with what vast Force they are compressed: but small Masses composed of Corpuscles of Fire, adhering to Corpuscles of fine fluids, will pervade the fluids, but neither pervade or wound the Tubes. If any other Spirits did subsist in our bodies, they must continually have something to impell or force them to extend the Muscles in the different Parts of the body: There
must

must be a Part of equal force, to move each other Part, from the Head, or wherever you begin, and a Part there, strong enough to move them all, and the last must be moved by a stronger Agent, or move itself; whereas we see no other Part concerned to move a Finger, but the Muscles and Parts which belong to it. Besides, considering those Spirits must be expanded, they must continually go off in a vast Quantity at the Pores, by the Lungs, &c. and must continually be supply'd by nearly the same Quantity; and I believe it will be hard to assign any other Rise from whence they can have their Supply or Impulse: Allow they were moved from Part to Part, by some Agent which we cannot comprehend, which they call the Mind or Will, can any one conceive, how Matter so small and so volatile, moved so forcibly, frequently, in all the Parts of our Bodies at once for a long Time, should not get off at the Lungs and Pores, when they are so open by Heat or Action, that even a Cloud flies out visibly, sufficient to fill all the Space in one of our Bodies in a very short time; nay, even to fill a little close Room, so as almost to stifle one. If voluntary Motion, be performed by Steam
issued

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issued out of the Blood, and that Steam go off in such Quantity, 'tis necessary that the Motion of the Blood should be so extremely quick as it is, and that it should be quickened in proportion to the Expence of the Steam, which Action supplies fresh Steam as above.

No reason
formaking
the Mind
an Agent.

I shall not endeavour to attribute any of the Operations of the Mind to Matter; but we find as far as we have yet reached, that God has so ordered Things in the inanimate World, that Matter moves Matter by the natural Qualities wherewith he has endued each Species of it, and by the shortest plainest Ways. And if these Agents can move the Blood and Parts of the Body according to the natural Laws of Matter, the Body will appear a more perfect regular Machine, and more simple. And if the Strength of each Animal be augmented and diminished in Proportion to the Supplies and Expence of this Steam, perhaps it may be possible to shew, that this Steam is the Agent which moves the Parts of our Body, as well voluntary as involuntary, and after what Manner it moves them: for I think it will be more easy to demonstrate how this Steam, which constantly fills all the Arteries and Nerves,
may

may extend and contract the Muscles, &c. with the Assistance of the Atmosphere, than any Agent yet assigned. The Obstruction of the Steam in any of the Muscles, disables them from extending and contracting, and consequently from moving the Part assigned them. When the Steam is too sharp or full of Salts, it wounds the Muscles, and makes them sore, &c. And 'tis likely when they are too moist and precipitate, or are condensed by Cold in the Muscles, they cause Rheumatisms, and Palsies.

That our Mind has Power to direct the Operation of all our Parts, to which Providence has given that we call voluntary Motion, is evident; and 'tis also evident, that the Force of that Operation, is limited in Proportion to the Quantity or Fineness of the Agent, the Freedom or Obstruction it meets with in the Passages, and the different Contrivance of the Muscles and Parts upon which it acts, and whether there be any other Share of the Operation performed by the Mind, when it would issue the Agent, which I suppose to be Steam, to one Part, than shutting the Valves or Passages to other Parts, and permitting that Steam to issue into the Muscles which are to be contracted,

or

or opening the Valves, and letting it, out of those Muscles which are to be distended, and, into others which are to be contracted, to expand them, and perform the Action, I very much doubt. 'Tis certain we are stronger when we have used Action to raise the Steam, than we are when we are beginning, or at the first Starting from Rest. And when one lifts a great Weight, as much as one possibly can, one forcibly contracts the Muscles of one's Belly, and keeps one's Lungs full or distended with Air, to squeeze out the Steam, and give Strength to the Parts; and as soon as one suffers the Muscles of one's Belly to relax, or the Air to respire out of one's Lungs, one loses Strength, and the Weight will fall. Waggon-Horses sometimes in drawing compress the Steam within, and stretch the outward Parts so much by the Steam, that it will push the Eyes out of their Heads.

CHAP. X.

Some Thoughts about the Manner of Sensation.

• **P** E O P L E talk of Spirits issued from the Brain along the Nerves, which perform abundance of Operations. Indeed there is a great Share of Blood circulates through the Head, and the Steam circulating with the Blood into the Head, has not the same Space for, nor the same Proportion of Pores to discharge it there, as it has at the other extreme Parts, because the Skull covers them, and it can only issue out at the Pores in the Ears, Eyes, Mouth, or Nose, which if it do in so much greater Proportion, may easily be discovered by applying a polished Glass: If it do not, it must be circulated along with the Blood, or secreted into other Vessels there: but if the Passages to the Nerves take their Roots here, perhaps the Steam which is prevented from being discharged by the Skull, may be separated by the Vessels, Brains, &c. from the blood, and issued along the Nerves, and employed there to their proper Uses. And I believe any Organ or Part, through which
Steam

Steam does not pass, or through which it does not pass in due Proportion, does not convey any Sense at all, or but a very faint or confused one. If this be so, I confess 'tis sufficient to make me doubtful, whether our Senses be not occasioned by the various Interruptions of the various sorts of Steam, issued from the different Parts or Organs of our Bodies, which makes one another rebound backward to their first Source; as when you touch any Part, the Steam issuing is stoppt, and must rebound and repulse other Steam successively backward from the Part touched along the small Nerves, up the great Nerve to the Brain, and they must have Sense all along, to distinguish each Part. Nay, may not the Eye issue Steam as small as Light, and that Steam be put into as quick Motion, and it put the intermediate Light into as quick Motion as we can conceive any reflected Light can be? For I suppose, they mean not that the immediate Corpuscles of Light which strike upon, and reflect from the Object, are reflected to the Eye, but that they move others, and they still others successively, till those moved next the Eye, strike it; and if the Steam issued at the Eye can push the Light against the Object,

ject, it will rebound against the Eye: And is it not more easy to conceive, how a Stream of Light issuing or moved from a Point to a Plain, may be equally interrupted, and cause Rebounds or Interruptions of all the succeeding Steam and Light in Motion, either to the naked Eye, or through Glasses or Telescopes, than how Bodies reflected from a Plain can center in a Point, or in any Point? 'Tis easy to conceive, how they might rebound from a Concave to a certain Point, and but to only one Point. If there be an Emission of Steam, may not it form as many or more Sensations or Ideas than the other can? And Fermentation can emit Light out of rotten Wood, and out of Animals, as some Part of the Glow-worm, they say, out of the Back of a Cat when rubbed in the Dark *. Nay, what is more to the Purpose, out of the Eyes of several Creatures in the Dark, where Glass or any Body more polished and capable of reflecting, than their Eyes, will reflect none. Nay, Light reflected from a polished Diamond or Glass, of the Bigness of an Eye, strikes not one's Eye with a Quarter of that Force which the
Light

* Instances where what issues out of the Eye makes the Creature see in the Dark. *Derham*, p. 122.

Light from another clear Eye does, which is supposed to admit the Light, but I suppose, emits it. I suppose they mean by Nerves, small, hollow, or porous Tubes, branched from the great Nerves which go from the Brain, or from the Brain itself, to the several Parts of the Head and Body, filled with what they call animal Spirits: Do those Spirits stagnate, or do they perspire at the Out-ends of the Nerves? or do they circulate from the Brain in some of the Tubes, and return thither in others? Is the Sense of Touching, &c. conveyed to the Brain by the Parts of the Tubes, or by what is contained in them? If by that contained in them, is it by touching the stagnant Spirits, or by stopping the Perspiration or Circulation of them, and making the Spirits rebound back to the Brain, or does the touching of the returning Spirits convey the Sense of the Touch of the Brain? If there be such Tubes, and the Sense of Touching be conveyed to the Brain by them, they must be branched to the most minute Parts of the Body: And the Spirits in the Nerves cannot circulate, because there is but one great Tube or Nerve from the Brain to each Part, and no other that returns to it; or, as one may say,
the

the Brain is branched out to every Part of the Body in Tubes attending the Arteries, and if the Spirits circulate not in them, they must perspire or be discharged at the Ends, otherwise they would be stagnant, and would need no new Supplies. Such a Degree of Cold as condenses the Steam in the outward Ends of the Nerves, or in the Muscles, takes away the Sense of Feeling, and almost the Power of Motion. What Effects different sorts of Steam, different Quantities, secreted or discharged at different Seasons, &c. may have upon the Nerves deserve to be traced, and nicely considered. That what I call Steam will be secreted into those Tubes is plain, and that there never is any Substance or Fluid found in them is certain, and it seems not necessary that they should be so large, to convey the Sense of touching to the Brain: And they are more likely than the Arteries, or any other Tubes, to have Outlets to the Muscles to convey the Steam which extends and contracts them alternately. Steam affects our Bodies with that Sensation, which Heat produces in Proportion to the Quantity of Corpuscles of Fire, or volatile Salts in it; When they are in too great Proportion, they can divide the Parts, &c.

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When in a due Proportion, it makes our Bodies warm, and it may rise with great Force by Fermentation, when loaded with proper Fluids, without affecting our Bodies with any considerable Degree of Heat.

C H A P. XI.

The Sides of the greater Tubes, as Guts, Arteries, Veins, &c. composed of lesser Tubes, their Dispositions, and Uses.

AS all the greater Tubes in the Body, such as Arteries, Veins, Ducts, Glands, &c. must be composed of still lesser in Proportion with the Mouths of the smallest in each inward, or into the Inside of the Tubes, till their Ends terminate at the capillary Glands outward, or into the Stomach, Guts, &c. inward; they must receive Juices still thinner and thinner out of the Blood, and secrete them into it again, or discharge them outward or inward, and filling the smaller Vessels in the Sides, must contract and straighten, and discharging or emptying them, lengthen and widen the Tubes they compose; issuing the Juices into the smaller, thicken

thicken the Blood, and secreting them into the greater Blood-vessels thin it, &c. And they must be directed by the same Agents and Causes: At what Times, and for what Uses, deserves to be nicely observed, and well considered, as well in the Lungs, Liver, Milt, Kidneys, &c. as in the outward Parts of the Body; but more particularly in the Sides of the Stomach and Guts, because their Effects seem to be of greater Consequence here. 'Tis easier to conceive than describe, how filling or emptying small Tubes which compose the Sides of a larger Tube, straightens or widens it. If there be so many small Tubes parallel and touching with their Sides, that they can be filled and extended into Circles, and emptied so, that their Sides may meet when they are empty, the Circumference of the great Tube will be near half the Length of the Circumferences of all the lesser ones; when the lesser Tubes are full, the Circumference of the great Tube, through the Centres of the lesser ones, will be but about one third of the Circumferences of all the lesser Tubes, and almost half of each lesser Tube; and of the Fluid in each of them, will be within that Circumference. If the lesser Tubes be so wide or so few,

that they cannot be extended into Circles when they are filled, but fill the great Tube, their Outfides will form half Arches, and their Infides Triangles, each with a Point at the Centre of the great Tube. If there be many Rows of the lesser Tubes, which compose the Sides of the greater, of different Sizes, or in different Positions, some parallel to the great Tube, some environing it, some diagonal to them, &c. emptying or filling; the lesser will widen or straighten, lengthen or shorten, open or shut the great Tube in the Manner aforesaid, and those twined about will compress the rest after the same Manner. If there be several Folds of Skin composed of hollow Tubes or Bladders, round the Infides of any Part of the Guts, &c. of sufficient Size or Capacity, 'tis plain, that when those Vessels or Glands in Tubes, or Branches of Tubes are full, they will meet, fill up the Gut, or, &c. ply into the Folds of one another, and form a Valve or Stop; and when the Juice is discharged, and the Blood repelled out of them, these Vessels, Glands, &c. will fall down by the Sides of the Guts, or, &c. in Form of thin empty Skins, and make an open Passage. The Valves in the Blood-Vessels, which only open one
Way,

Way, and are kept shut when the Force on the Outside is strongest, and are open'd when the Force on the Inside is strongest, need be of no other Figure than those of Caulids in a Pump, and need no filling or emptying of the small Vessels, but only to be bended forward and backward, so as to open and shut them.

CHAPTER. XII.

A Description of the Duets, &c. for secreting, and the Glands for collecting and discharging Juices out of the Blood.

GLands are a Congeries of small Vessels, contrived to collect and discharge, the necessary Quantities of the several Sorts of Juices, which jointly we call Blood out of the Vessels in which it circulates. The Blood in a healthy Person should be composed of such a Mixture of Juices, that together they may not be too crass to pass the smallest Blood-vessels, nor too thin to let the Steam pervade them without circulating them; and of a sufficient Proportion of Corpuscles of each Sort and Size, necessary to be se-

creted to the several Uses, in the several Parts of the Body; and they should by Steam and Action be kept so divided, and hindered from precipitating, stagnating, or coagulating; that as some are fixed to the Parts, secreted or born off, others of the same Kind, should be supplied by the Steam, by that animal Process from the Aliment in the Stomach and Guts. If the Blood were returned as hot as it goes to the outward Parts, the Heat would be augmented every Time it circulated, and it would be rendered so thin, that the Steam would pervade and not circulate it, nor would the Corpuscles be of proper Magnitudes for Secretion. Perhaps this is the Reason why one's Pulse is not much heightened when one sweats in Bed. The Glands, whether they be a few together, or in large Bunches, must have Ducts into them out of the Blood-vessels, or out of one another; some of them may have Passages out of the Blood-vessels, some into one another, and all of them Mouths with small Valves, to open and discharge outward, or into the Mouth, Stomach, Guts, or out of the Brain, Lungs, Liver, Milt, Kidneys, &c. which are all composed of, or full of infinite Numbers of Glands, and secrete the several sorts of Matter

Matter out of the Blood, mostly in Form of Steam; Part for Uses of the Parts of the Body, Part for Discharge, as well as the outward Pores in the Mouth, Skin, &c. That there are such Glands and Juices secreted inward into the Stomach and Guts (of which I shall speak hereafter) is evident by their Discharges in Vomits, Purges, Looseness, but most demonstrably in the bloody Flux. 'Tis likely most of their Ducts and Passages divide the Juices by the Figures or Dimensions of their Apertures. But there may be some Ducts or Passages, so turned or bended, that they may admit Corpuscles which are round or angular, and not those which are smaller, but long, fibrous, or crooked, and some the contrary. Suppose there be Corpuscles, or little Masses in the Blood of ten different Sizes or Figures, the ones least or smallest, and the tens thickest or largest, &c. And the Passage or Duct into one Gland admit them all, and the Passage out again into the Blood or other Glands, let go the nines, and all smaller by Degrees, that Gland or Vessel will be filled with tens. If the Duct into another admits fives, and all smaller, and the Passages out of it into the Blood, or into smaller Glands in its

Sides or Valves, admit fours, and all smaller, it will in Time be filled with fives, and so larger or less, smaller, longer, crooked, &c. down to the smallest Glands in its Sides or Valves. And the smallest Glands in the Valves or Sides of the greater, must discharge outward, or into the Stomach, &c. first: and the finest Juices first, and so successively to the Juices which consist of the grossest or crookedest Corpuscles or Particles in that Set of Glands at least; because the discharging the Juices out of the Glands in the Valves and Sides, of the greater or more inward, opens the Mouths of them, and permits them to discharge. When the Steam is too strong, and that or any other Agent opens the Ducts in, or Passages out too wide, they will admit or let go too large; and when the Steam is too weak, or the Parts swelled or pressed by the Steam, extending the Sides of the greater Tubes, wherein the Ducts or Glands are, or any other Agent, makes the Ducts into, or Passages out, too straight, they will only admit, and let pass those which are too small, and not secrete those of proper Sizes, or Figures, and they cannot execute the Offices of one another. If those which should admit tens only admit

admit nines, the tens must all stay in the Blood, and the nines admitted there will be wanted at their Post, and thereby in Time the Blood will abound with tens. If those which should only admit and discharge ones, admit and discharge ones and twos, the twos will be wanted at their Post, as in Fevers, when the Urine is red, &c. And 'tis likely the Ducts to, or Passages out of the Glands to the Gall-bladder do not secrete, or the Bladder does not discharge, when the outward Parts are filled with that Juice in a Jaundice. If the Passages out of the Glands into the Blood, which should retain but one sort, retain two sorts, the two sorts together will not execute the Office of the one sort. And Corpuscles of Salt of different Figures or Sizes, and different Quantities of the same sort, or differently impelled, may open the Mouths of the Glands to different Degrees, when the Number of the Salts are but few or weakly impelled, they may open the Mouths of some of the smaller, and not be enough of them to open the Mouths of the larger. If the Mouths of the Glands be kept open after they have discharged the Juices collected in them, they will discharge the Juices promiscuously
out

out of the Blood, which can pass their Ducts and Mouths without forcing them, And 'tis very likely, the Ducts in, and Passages out of the Vessels and Glands in Plants, divide, collect and retain the several sorts of Salts, Juices, &c. which issue out of the Earth into them after the same Manner: so that in Proportion to the Size, Figure, &c. of the Ducts and Passages in each Plant, and in each Part of each Plant, as they grow or encrease, or as they decrease or wither; and thereby alter the Dimensions or Figures of the Passages in the different Seasons, the Juices in each Part of each Sort, are nearly the same, some Alteration being made by this or that Sort abounding more or less, by the Proportion of this or that Sort in the Soil, &c. And whether the Pores in some sorts of Stone, Metal, &c. may not admit and retain some sorts of Salts, &c. I cannot tell, but the same sorts of Salts, &c. are frequently found in the same sorts of them. And those of smallest Pores admit and retain Fire, either in the Earth or open Air, such as Flints, &c. and so of Wood, Oil, &c. and the Corpuscles of Cold after the same Manner. When any Body has a greater Quantity of Corpuscles of Heat or Fire not
clog'd

clog'd, than is in the Part we touch it with, the Corpuscles issue thence into the Part, cause a Sense of Heat, and so on the contrary. The Corpuscles of Fire mixed or entangled with Water, and most other sorts of Fluids, except Oil, can act in Fermentation, but mixed with any Fluid except Oil or Spirits, they cannot act in the Air, till most of the Fluid be exhaled, or burn off by Fire or Heat, and the Fuel be almost dry, and doubtless as the Moisture is exhaled out of any Body in the Air, and the Pores contracted, Corpuscles of Fire, volatile Salts, &c. enter and lodge in them.

The several Ducts to the several Glands in the Body, are proportioned each to admit, and the Passages out into the Blood to retain, each, Corpuscles of different Magnitudes or Figures, to form Juices of different Consistencies and Qualities; as the Juices which supply the Eye, Mouth, Gall, Stomach, &c. and perhaps the Brain to supply the Nerves with fine Steam. And the Capacity of the Glands are proportioned, each to contain sufficient Quantity and their Mouths, outward Ends or Valves, to discharge sufficient Quantity; each for their respective Uses; and they are secreted in Proportion to the force of the
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the Steam, and the Supply of it; in the opening of the Pores or Valves in any Part, which gives way for the Steam to drive out the Juices in the Glands next adjacent, along with it through the Skin or that Part, either without, or in the Mouth, Stomach, &c. till the Stock in the Glands be spent; and after that only Steam, and such a Quantity of mixt Juices, as can be constantly secreted, till shutting their Mouths stop the Discharge, and they be by Degrees replenished; and this is done involuntarily, sleeping or waking, though perhaps the Will has some Power to direct or encrease the Force of the Steam, especially that in the Nerves, waking more than sleeping. This Operation of secreting the Juices of several sorts, at the Glands, in the several Parts, will not appear so difficult, if their Number and Disposition be well considered; nor need there be so many Corpuscles of lesser Sizes returned out of the Glands into the Blood, for there is such an infinite Variety of Ducts and Glands, and such an infinite Disproportion in Number, between the smaller and the greater Vessels or Gland, that if one was to imagine the Stomach and Guts clean, and the Blood and Juices were all discharged

charged into them, and the Blood-vessels were to stand empty and distended, and the Blood and Juices were equally mixed, and so mixed, issued out into the Blood-vessels, &c. the thinnest Parts or Juices would, as they passed the larger Vessels, find their Way into the infinite Number of small Outlets, and the Blood and Juices in the larger Vessels would almost immediately be of the same Thickness they are at present, except where the Ducts to the Glands are so straight, that they are designed to fill them but slowly, so that the Glands may be stocked when there shall be Occasion to discharge the Juices for dissolving the Meat, discharging the Excrements, and for such Uses as they are not constantly wanted, but at some Distances of Times: And when all act regularly this must be done, in every Circulation of the Blood, at least a considerable Proportion of it. This might be demonstrated; If a Pipe of a great Length, were bored in the Sides with Holes of different Sizes, proportioned in Number to the Quantity, and in Dimension to the Sizes of the Corpuscles of several sorts of Liquor, and those Liquors were all mixed together, and one sort more, whose Corpuscles were too large to pass any

any of the Holes, were forcibly pumped in, and the Pipe forcibly compressed, the Liquor whose Corporacles were largest, would be found separated at the far End.

C H A P. XIII.

The Contrivance and Uses of the Bags, Valves, and Stops of the Stomach, the several Parts of the Guts, &c. the Time when, and Manner how those Bags and Tubes are extended or contracted, their Valves opened or shut, and how they discharge the Excrements downward, all involuntarily.

IN Order to know what is done in the Guts, we ought first to consider the Form of their several Parts, the several Divisions made in them by Valves or Stops, the Manner how each is distended or contracted, how the Valves between each Part are shut or opened, the Consequences of extending or contracting each Part, and of shutting or opening each of the Valves or Stops which divide the Parts. First, The Gullet has one or more Valves at the upper End; called the *Pharynx*, so contrived, that they

they resist strongly, and hinder the Steam, Meat, Drink, &c. from ascending out of the Stomach, unless they be weakened by emptying the Glands in them, but open voluntarily and easily, to let the Pressure of the Jaws or Air force down the Meat or Drink, and even whilst they are going down, that the Steam should not get Vent; for we cannot keep it open, and pour down a Fluid continually till the Stomach be full, but so much only at once, as the Space between the Root of the Tongue and that Valve will contain, and then shut up the Passage, at the Root of the Tongue, which at once opens the other, and presses the Fluid down, and so alternately. And the Pressure of the Air has some Share in the Action, for if one empty one's Lungs of the Air, take one's Mouth full of Fluid or Meat, and shut one's Mouth and Nose, one can swallow little or none of the Fluid or Meat, but press it down in small Quantity at once by the Strength of the Jaws, and the Remainder of the Air left in one's Lungs. It will be hard to ascertain the several Positions of the Stomach, and the several Parts of the Guts, because the Moment a Body is opened, the Steam in them extends them, and displaces every Part.

Part. The Stomach can be distended to hold near a Gallon, and contracted into the Space of a Pint. When the Steam in the Stomach or any part of the Guts is weak or abated, so that the outward Pressure prevails, the greater Share of the Blood is forced into the inward Parts, and the Vessels and Glands in the Sides of the Stomach, or that Part of the Guts, are suffered within, and forced from without, to admit a greater Quantity of Blood and Juices ; so when the Meat, &c. is discharged from the Stomach, and the Steam abated, the Air from without forces the Juices to secrete out of the Blood into the Glands of the Stomach, and filling the Vessels and Glands contracts the Stomach, and lessens its inward Capacity by Degrees, as the inward Force abates, and its Arteries, Veins, Glands, &c. fill. When the Stomach is contracted, and one takes Meat and Drink cold, the Juices issue, let the Stomach extend, and the Cold condenses the Steam in the Guts, and makes Room for it. When the Meat and Drink is taken warm, they do not condense the Steam in the Guts, but extend the Rind of the lower Belly to make Way, and gives one a greater Sense of Fulness with a less Quantity. When one
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has eaten a good Quantity of warm Broth, or, &c. one loses one's Appetite: But if one drink some very cold Liquor, it condenses the Steam, and makes the Stomach less distended. or more empty, and the Guts make more Room for it, than before one drank the Liquor, and presently after one recovers one's Appetite. When the Stomach is distended with Steam, and one takes Meat and Drink, it condenses the Steam, and the Blood and Juices press into the Sides of the Stomach, contract them, and make them press close about the Fluids, &c. As the Fluids, &c. expand, the Sides of the Stomach must extend; when the Ferment is high, the Steam can extend the Sides beyond the Extent of the Fluids, and form a Space only filled with Steam, as we see in Creatures after they are opened. When one eats too soon before the last Food be discharged, the Steam abated, and the Stomach contracted, and the Glands, &c. in its Sides filled with Juices, the new will be mixed with the old, and if it be taken warm, will keep the Stomach extended, and lie heavy for want of Juices to ferment it, and raise the Steam. If it be taken cold, it will condense the Steam, and the Stomach may contract so much,

and after some Time, yield a few Juices to raise the Ferment. When the Stomach and Guts are kept distended, and the Juices intended for Fermentation, &c. are hindered from secreting out of the Blood into them for any considerable Time, the Meat will not be duly digested nor discharged; and if near the same Quantity of Juices, as are produced out of the Diet every Day, be not discharged with the Excrements, they must be discharged by Urine, Sweat, &c. or perhaps fall upon the Lungs, or remain in the Blood, and by Degrees overstock it, make it sharp, occasion Scurvy, Jaundice, Strangury, Rheumatisms, Gout, &c. And when by any means they get sudden Vent into the Stomach or Guts, occasion Fevers, Surfeits, Gout in the Stomach, Colics, &c. according to the Quality, Quantity, &c. When one has eaten a great Quantity of cold Fruit, or any such Thing, that the Juices in the Stomach cannot raise a Steam whilst they are secreting, and so are still prevented from making any Resistance in the Stomach, the Glands will still secrete as fast as the Ducts can convey the Juices into them, and at last secrete the Blood into the Stomach. And if such Fruit or other cold
Matter

Matter cannot be fermented, the Juices will sometimes open the Valves of the *Oesophagus*, and the Stomach will, by the Assistance of the Pressure of the Air, Expansion of the Steam in the Guts, and Contraction of the Muscles of the Belly, throw it up. If it be carried down into the Guts, and abate the Steam there, it will both abate the Course of the Blood, and give way for the Juices to secrete out of their Glands, and afterwards the Blood. If it raise a Ferment there it may occasion a Fever. If it open the Valves, and force its Way downward, it will occasion what they call a Bloody Flux. Indeed Cattle eat cold Herbs, &c. but in common Pasture they are so long in filling their Stomachs, that they do not condense the Steam in a short Time, and their Blood contains not so much Spirits or volatile Salts; so that when the Steam is condensed, the Juices do not flow in so violently, nor are so sharp. And they choose such Plants as they can digest, and refuse the four cold Plants, and if for Hunger, or by being kept long to dry Meat, they be forced to eat too much of them at once, or too hastily, they have much the same Effect as Colic, Gripes, &c. and scarce any Creature except Swine,

will eat much cold raw Fruit; and 'tis likely it will have the same Effects upon them. And as Cattle are ordinarily far longer in filling their Stomachs, so they eat a much greater Quantity; and make greater and more frequent Discharges in Proportion, and their Glands for Juices for Digestion must be contrived to make more leisurely, and more constant Discharges; and the Glands for discharging the Excrements to be sooner filled, and more frequently discharged. The *Pilorus* or Outlet from the Stomach into the Guts seems to have Valves, and the Sides of the Neck are thicker than other Parts, and the more Vessels there are, when they are filled, will close that Part sooner than where they are thin: whether when the Steam in the Stomach is spent, the Vessels in the Sides fill and contract the *Pilorus*, or shut the Valves before we eat or drink, I cannot tell; but when Meat and Drink goes cold into the Stomach, the cold almost wholly condenses the Steam, and the Resistance within being taken away, the Blood and Juices will be violently pressed thither by the outward Compressure of the Air, and the *Pilorus* must shut and resist any thing from passing out of the Stomach into the Guts,

or

or out of the Guts into the Stomach, till some Juice open the Glands in its Valves, or in its Sides, and by discharging the Juices out of them, weaken or extend them. Whether the Fluids in the Stomach fermented to such a Degree, or the Pancreatick or Gall, or other Juices out of the Guts, assist in opening it, I cannot tell; perhaps it may be opened by the Strength of the Steam in the Stomach, by extending the Stomach, and repelling the Blood out of the Tubes in the *Pilorus* to let the Steam pass into the Guts: But I think it cannot be opened by the Steam in the Guts to let it pass into the Stomach. There seems to be a Necessity that the *Pilorus* should be shut and opened, for if there were not a stop there, the cool Drink put into the Stomach would run down into the Guts, and condense the Steam there; things digested and undigested, Lumps of Solids among the Fluids, would go altogether. And when the Steam in the Stomach grows weak, the Steam would arise out of the Guts, hinder it from contracting and secreting Juices for fermenting and dissolving the Meat and Drink. When the Stomach is newly filled, and the *Pilorus* shut, its Bottom will settle and hang lower down,

and the highest Parts of the Guts being extended by the Steam in them, will rise upward, and continue so till the Juices discharge, the Ferment begin, extend the Stomach, and open the Mouth of the *Pilorus*. Whether the Steam in the upper End of the Guts can raise them so high, that the Juices issued from the *Pancreas* and Gall-Bladder, can run into the Stomach to assist in heightening or slackening the Fermentation, or for some other Uses; or whether that Position of the Guts can invert the Gall-Bladder, and make it empty; or whether those Juices are only issued into the Guts, I have not had Opportunity to observe. When the *Pilorus* opens, the Steam will issue down into the Guts, and the Contents of the Stomach, which are thin enough, and above the Level of the *Pilorus*, will go off into the Guts, and when the rest is as much digested as it can be there, the Agents gone off, and the Steam abated, and the Cause which extended it weakened, the Air presses the Blood and Juices into its Sides, and contracts it. The Pressure of the Air upon the lower Belly, and the Expansion of the Steam in the Guts below, jointly lift up the Bottom of the Stomach by Degrees, till it come to the
Level

Level of the *Pilorus*, and so leisurely empties the Contents downwards, and contracts and compresses the empty Stomach into a very little Compass. The Sides of the *Duodenum* are thicker than the rest of the Guts, whether it be to resist the Sharpness of the Juices issued into it, or the Strength of the Steam arising in the Guts, when the *Pilorus* is shut, or contract, issued Juices, and extend, I cannot tell. When one has fasted very long, sometimes one loses the sense of Hunger; a new Ferment rising in the Stomach, and extending it: whether the Glands then discharge those Juices, and they work upon the Remains or Phlegm there, or whether some Glands secrete some mucous Matter, which jointly with them makes a Ferment, and is designed to keep in the Fire, I cannot tell: But if that go off the Stomach alone, it sometimes causes Colical Pains, &c. sometimes about an Hour after eating or drinking any sort of Matter, which irritates the Glands in the Neck of the Stomach, especially the Broth of stewed Beef, or such Things, which are full of Oil mixed with Salts, which swim upon the Top of the Contents in the Stomach, or if one ride hard, or use Exercise which throws that Matter up the

Neck of the Stomach, it opens the Glands, and makes one puke some of that Mixture, and some time after eating Oil or fat Meat, one pukes some of the Juices secreted out of the Stomach, clear or unmixed, which induces me to believe, that they are secreted out of the Glands above the Meat and Drink in the Stomach, and prevented from mixing by Oil or Phlegm swimming at the Top of the Meat and Drink in the Stomach, and 'tis likely are intended to dissolve what so swims at the Top, and escapes the rest: For I cannot perceive how such a thin penetrating Juice could ascend from the Bottom, and escape mixing with the rest: sometimes afterwards the Oil comes up mixed with those Juices desperately sour, bitter, or, &c. I think the Guts hang upon the Mesentery, so that the Sides of them are always full of Steam, and it is likely the Lacteal Vessels, through which it passes, have their Mouths on the upper sides, and are thence continued into the Glands, and that the Steam can pass along the upper Sides of the Guts from Valve to Valve, especially where the Excrements are fluid, and the Parts not contracted without pervading much of the Fluid. The two first Parts, viz. the *Duodenum* and

and *Jejunum* make so long Bends, that but a small Quantity of the Fluid Mash descending from the Stomach rests in them, but falls down lower, so that they are seldom found filled with any Thing but Steam, and the greatest Share of the Lacteal Vessels issue out of the latter, which is another Evidence that the Chyle passes in Form of Steam. The third Gut, or *Ilium*, hangs in shorter Bends or Folds like Bags, so that when they are filled with Excrements, and extend or hang down, they retain them. The fourth, or *Cæcum*, hangs like a Branch between the Bottom of the *Ilium*, and Top of the *Colon*, and serves as a Bag to reposit the Excrements which fall down the *Ilium*, till the Valve at the Top of the *Colon* open, and then the Excrements are discharged out of it into the *Colon*, after the same Manner as the Stomach and other Bags, by the Expansion of the other Parts lifting up its Bottom, &c. The fifth, or *Colon*, hangs in Bags much after the same Manner as the *Ilium*, and is divided into Bags, by Ligaments or Strictures, and retains the Excrements much after the same Manner, and prevents the fluid Mash from falling down, all at once towards the lower End, and preserves

preserves Part of the Fluid in each Fold to raise Steam. At the low End of the *Ilium*, and upper End of the *Colon*, there is a Valve placed, so that nothing can pass but when it is opened. As the Excrements or Mash settle lower, the Fluids go off in Steam, and the Remainder becomes still less and less Fluid. Contraction, or Distention, 'tis likely has least Effect in the two upper Parts, because they are mostly empty, or their Contents are very thin, unless some Stop by Phlegm or, &c. happen. But perhaps in the Folds of the two lower, where the Excrements are less fluid, the Bags may contract so far as to hinder the Steam from passing through them, till Juices secrete, raise a new Ferment, and re-extend them. If the *Cæcum*, and the low End of the *Ilium*, next the Valve at the Top of the *Colon*, be filled with thick Excrements, when there is no Steam in them, or below sufficient to resist, the Steam above will press upon them, and push or thrust them forward with a great Force. If the Guts were all of one Wideness, and not so bended and girt with Strictures, the Fluids would run down to the next Stop or Valve, make no Stay in the upper Parts, fill the lower End, and leave the
upper

upper End empty. As they are contrived when the *Pylorus* opens, and the Steam and Fluids go off from the Stomach, they will extend the Bags as they go, fill the first Bag first, and when that is full, the Fluid will run over the Bend, or Stricture to the next, and so fill each successively as more Fluid goes off. If the Guts had a serpentine Winding, or Peristaltick Motion constantly, it must be performed by the Steam driving the Blood along the Arteries, at each Push, moving the Guts as it passes the Arteries in their Sides, which Blood must be repelled along the Veins in the Sides of them, by the Expansion of the Steam within the Guts, and the Resistance of the Insides of the Trunk, or if they only had such a Motion sometimes, it might be performed by the Motion of the Steam, when the *Pylorus* opens, issuing from the Stomach downwards, and the Fluids along with it, and so on after the Guts are filled with Steam, as it gets Vent: But if there were such Motions, they cannot be sufficient for discharging the Excrements out of the several Bags and Folds, and at last out of them at the Fundament; nor do I think it possible, that the Guts can have any Peristaltick Motion, because they, &c. fill the

fill the Trunk close, and have no Room to move and shift in, otherwise than as the Steam abates in one Part, and encreases or extends in another; the one Part will be compressed, the other extended, and nothing can descend, or be emptied downward out of the Bottom of the Stomach, or the Bags of the Guts, but by their being lifted up to the Level of the *Pilorus* of the Stomach, or the Tops of the Bags, or Strictures in the Guts. When the Stomach begins to discharge into the Guts, it fills them, and extends them: by their Ferment as they fill and extend, the Resistance in the Stomach being lessened, they lift up its Bottom, and by Degrees empty it, as the lower Parts of the Guts fill and extend with the Ferment and Steam; and as it abates in the upper Parts, they lift up the Bottoms of the Bags in the upper Parts, and discharge the Fluids downward successively to the *Colon*, which seems to be another Repository for the Excrements, wherein 'tis likely they undergo some farther Fermentation like a second Stomach; but differs in several Respects. It has lacteal Vessels out of it to carry off the Steam when there is a Ferment in it. When it is extended with Steam, it lifts up the
Bags

Bags in the Guts above it, and makes them empty downwards towards it, and when the Valve at its Top opens, which perhaps is when the Steam in it abates, the Excrements at the lower Ends of the Guts above will fall, or be pressed into it. Whether the Bags in the Guts, or the Valve at the Top of the *Colon*, always keep Fluids in them to raise Steam, and keep them somewhat extended, I am not certain; but if they ever make a sudden Discharge into the *Colon*, and the Steam in them be much weakened, perhaps they may contract, and their Glands be stocked with Juices to raise a new Ferment in the next Supply; and the *Colon* during the Time the Steam in it was weak, would replenish its Glands with Juices to raise a new Ferment, and supply the lacteal Vessels with Steam; whilst that in the Guts is weakened. And whether when such a Discharge is made into the *Colon* out of the Guts, or the Fluids are mostly born off, and the Steam weakened there, and the Steam in the Stomach be strong or stronger than that in the Guts, it may not contribute to open the *Pylorus*, and give the Steam and Mash Passage into the Guts, I cannot tell.

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When as much of the Mash has passed one of the Stops that the Steam above is abated, the Valve shuts by the Pressure upon the Blood within the *Colon*, rests or leans upon the Loins slanting, so that when the Fermentation in it is over, and the Steam abates, the Pressure of the Steam in the Guts above, forces the Excrements in it downward. Whether the Fermentations in the several Parts are carried on by the Juices issued out of the Sides of the Stomach, or they are renewed or assisted by Juices issued out of the Sides of the several Parts of the Guts, or by the Gall and Pancreatick Juices, or whether there is always as much fermented Fluid left in the Bags of the Stomach, Guts, and *Colon*, as will contribute something like Leaven, to raise a new Ferment in the next Supplies of Meat and Drink, and whether, the longer they continue there, the stronger they may grow for that End, in defect of Juices being secreted out of the Blood, I undertake not to determine. The *Rectum* reaches straight from the Bottom of the *Colon* to the Valve at the Fundament, there is no Valve at its Top, because I think as the Excrements are generally pretty thick there, they

they would not very easily pass a Valve, but that I think is supplied by the Thickness of the Sides of the Gut, whereby the Juices issued out of the Blood into the Vessels and Glands in its Sides, can shut or contract it close, and by issuing those Juices extend it. Whether each Ferment in the *Colon* opens the End-Gut, and presses the Excrements into it, or it is opened by issuing the Juices out of the Glands in its Sides, deserves to be considered; the latter I think is more likely, because if it were kept open during the Fermentation, the Pressure would be too great, and too long upon the Fundament. 'Tis likely when the End-Gut is full of Excrements, suppose half fluid, half solid, as the Steam goes off, and bears off the Fluid, the Top of it, at the Bottom of the *Colon*, contracts and partly shuts, and when most of the Fluid is gone off in Steam, the Gut contracted, and the Fluid as it were squeezed out, and the solid Excrements formed in a Mould, the Glands in the Sides will be filled with Juices secreted out of the Blood to be ready upon Occasion to issue, extend the Gut, and discharge the Excrements. That the End-Gut, and perhaps the *Colon* contracts, is evident by the hard Excrements
of

of the same Man, moulded at different Times, of different Thicknesses; and 'tis more demonstrable in some Brutes, where every Bag forms the Excrements into round Lumps, according to the Dimension of each Bag so contracted, sometimes greater, sometimes less. Any sudden Increase of the Force of the Steam, such as when the outward Pores are suddenly resisted by an Increase of the Pressure of the Air, or the outward Pores being suddenly shut by an Increase of Cold, or by the Emission of the Juices into the Stomach after eating, which may encrease the force of the Steam suddenly, the Steam may prevail where there is least Resistance, and force the Juices out of the Glands into the End-Gut, and cause a Discharge of the Excrements. When the Steam is too thin, so that it goes off too quick at the Pores, its Force inward is not so great, and one seldom has any Discharge then. Sometimes the Juices which open the Glands in the End-Gut and Fundament may descend from above, as in a Purge or Looseness, or out of the *Colon* when the Juices secrete in too great Quantity, or too sharp, raise too high a Ferment there, and open the Glands in the End-Gut. When that

Gut

Gut is open, it gives Way for Excrements to settle down into it. When that and the Fundament both open at once, both thick and thin go together, till the Steam within the *Colon* abate, and the outward Pressure of the Air drive in the Blood, &c. contract the End-Gut, and shut the Fundament. When the Top of the End-Gut is contracted close or shut, if there be any Excrements below, you may discharge them, if none, you may have the Piles, or discharge Juices or Blood. When the Fundament is not opened by discharging Juices, the Excrements may lodge in the End-Gut very large and hard, and you cannot discharge them. When there are Excrements in the End-Gut, and the Valves in the Fundament are weakened by discharging the Juices, if the Top of the End-gut be not open, and the Steam in the *Colon* be not pretty strong to press down the Excrements, the Discharge will be made with great Difficulty. When there is any Stop at the Bottom of the *Colon*, or the Top of the End-gut is contracted, so that the Excrements and Steam fill not the lower End of the End-gut, the Fundament will be pressed in higher than at other Times, which is a plain Indication, that the Resistance

The Oc-
casion of
the in-
ward and
outward
Piles.

sistance within is weaker; and there being little Resistance within, the Air and Steam will press the Blood into the sides of the End-gut, and force the Juices into the Glands and extend them; and if it continue long, or be so often, occasion the inward Piles; and if the Juices be salt or sharp, they may fall down and rest upon the Valves of the Fundament, and cause the outward Piles. If upon having a Stool, Part of the Valves of the Fundament be extended outward, the Juices will press into them, and form little Bags resembling Piles, and the Juices will be discharged out of them outward; but if they be speedily put up with the End of one's Finger within the Valves, that will be prevented. If the Steam in the End-gut be strong and resist them, so that they are difficult to be forced up, or are pushed back, if you discharge the Steam downward, they may immediately be put up easily. If the Parts be dry, so that they will not slide up, a little Oil, upon the End of the Finger, makes them slip up. The Vessels in the Side of the Stomach and Guts, and the Valves in them must be extended, and the space within contracted or shut either by Blood and Juices pressed into them, or by animal

Steam, the
 Agents,
 contracting
 the
 Stomach,
 and the
 Time it
 acts.

mal Spirits or Steam issued into their Muscles (if they have any) and it must be done only when the Resistance within is abated; I think it cannot be done by the latter, because we can direct the animal Spirits to act upon the Muscles; and the Will has no Power there; besides they are frequently long in contracting, and continue long contracted; and I think the Muscles in any Part cannot be long extended, but the Force will abate. If the Steam be abated or condensed, or the Excrements discharged suddenly, the Sides of the Part will contract, and the Valve will shut suddenly, if leisurely, leisurely. But the Glands in the Sides of the Stomach, Guts, &c. for secreting Juices for Fermentation, &c. need not be suddenly filled, because they are only needed upon a fresh Supply. Whether the Mouths of the Glands which contain the Juices for Fermentation, in the Stomach and Guts, be opened to secrete them, by condensing the Steam there, or by some Corpuscles of Salt, or, &c. in the Aliment, or by the Friction of the Aliment upon their Sides by the Motion of the Lungs, Body, &c. till they raise a Steam, and whether that Steam extending the Sides of the Parts, press out the Remainder of the Juices, or

these or other Causes jointly contribute, I cannot tell. But 'tis plain when the Steam in the Stomach, or any Part of the Guts becomes stronger than the Pressure of the Air, it will repell the Blood out of the Blood-vessels in the Sides of that Part, extend the Sides of that Part, and straighten or flatten the Blood-vessels therein. Whether the Glands in the Valves or Stops in the Guts be opened by Steam, which always has Passage from stop to stop, unless accidentally stopped, or by Juices secreted the last out of the Glands in the Sides of the Part above, which in a Vomit or Purge seem to be most penetrating, or by some Juices issued out of peculiar Glands near the Valve or Stop, or by the Juices in the Mash when they are fermented or sharpened to such a Degree; or whether one of them may be opened by one Means, and another by another, I cannot tell. The Corpuscles of the Steam may open the Glands in a Valve or Stop, where they have free Passage to it, but if there be thick Excrements above it they will stop it. If the Juices pass any considerable Distance from above, they must operate on all the Parts they pass through, and make the Bags, or Folds, capable of sending down the
Fluid,

Fluid, and there must be a considerable Quantity of them, if they mix in the Mash, to act at the Bottom: If the Juices issue near the Valve or Stop, they may come at it unmixed, and without making any Alteration above; though they are all opened by the Corpuscles in some sort of Diet, and by the Mash when fermented, or sharpened by a great Quantity of Juices. I think ordinarily the Glands in the Valves, especially the low ones upon which the drier Excrements rest, are opened by Juices issued out of the Sides of the Guts next above them; however it is, a plentiful Discharge cools and eases all the Body more than could be done barely by discharging the Excrements, 'tis likely it is by discharging the Juices out of the Glands, Blood, &c. During the Time that there is an extraordinary Ferment in the Contents of the Stomach and Guts by the Qualities of the Meat, Drink, by too great an Emission of Juices, or that all the Parts continue too much distended by the Crasiness of the Steam or Stoppages in the Vessels, the Discharges of the Excrements downward cannot be regular; because none of the Bags can be lifted up and emptied; and when the Steam does not rise in due Proportion in any of the

lower Parts, for Defect of the Causes
 aforesaid, they will not extend and lift up
 those above them, to discharge the Fluids
 out of their Bags downward. When too
 great a Quantity of Juices, or Juices too
 sharp, are secreted into the Stomach, or
 any of the upper Parts, they do not only
 make too great a Ferment there, but in
 all the Parts as they pass, till that Fluid
 and all it mixes with, be discharged. When
 the Guts are vastly distended, and the
 Stomach contracted, one can scarce get
 any Meat or Drink down into the Sto-
 mach; and perhaps they scarce let the
 Bottom of the Stomach settle low enough
 to keep the Fluids till the Meat be diges-
 ted. It will not seem strange, why one
 Part of the Guts contracts, while another
 extends, or why the Steam in one Part is
 stronger than the Steam in another, since,
 as I said, the Strength of such infinitely
 small Agents, is to be computed by the
 Numbers. And 'tis easy to compute how
 vast a Difference there must be between
 the Number of Agents in the Mass,
 when it is newly put into the Stomach,
 and the Juices secreted into it; some of
 their Corpuscles being extremely subtle,
 and some of them capable of being vast-
 ly expanded; and in the Remainder of
 the

the Mash, when it has undergone the Fermentation, and the Agents and Parts they could bear are mostly gone off in Steam, or between that Remainder of the Mash when it's so left, and when a new supply of Juices are secreted into it, and a new Fermentation raised, or between the Juices issued for Discharge by the Sides of Excrements, almost dry, which Juices will be immediately expanded and raised into Steam, and the small Quantity of Steam which could be issued out of those dry Excrements. If there were not such Stops and Bags in the Stomach and Guts, the Stomach could not retain the Aliment till it had digested it, the small Guts till most of the Fluids were born off in Steam, the *Colon* till it had fermented the Remainder a-new, the End-Gut till it had sent off the Humidity, and secreted Juices to discharge the Excrements. If there were not such Valves or Stops, which when shut stopped the Steam, no Part could be contracted by an Abatement of the Steam there, because it would be equal in all Parts, nor could the various Operations of each Part be managed alone, if those Valves did not divide, and keep them in several Parts as they are. When the Steam is spent in one Part, the

The Uses
of the
Stops and
Bags in
the Sto-
mach and
Guts.

Valves can shut, the Juices contract that Part, and discharge for their several Uses, while the Steam issues from another Part to circulate the Blood. Besides all the Mash would fall to the lowest Parts, and they would be full, and all the upper Parts empty, and the Steam would continually press the Excrements upon the Fundament, and when it opened, make too great Discharges both of Excrements and Steam. Indeed human Bodies, and those which go upright, have more occasion for Stops in their Guts, than those Creatures have which go upon all four, with their Bodies parallel to the Ground.

The Secretion of the Juices into and out of the Glands, the raising, passing and perspiring of the Steam out of the Pores, Lungs, &c. and the Discharge of the Excrements being principal Actions in the Body, let us consider what furthers or hinders them.

CHAP. XIV. SECT. I.

The common and accidental Agents or Causes, which contribute to make the Juices secrete out of the Blood-Vessels into the Glands on the Sides of the Stomach and Guts, with their Effects and outward Appearances.

Discharging the Meat and Drink, and especially the Steam, abating the Fermentation, condensing the Steam by cold Meat or Drink, or by cool heavy Corpuscles in them, &c. which abates or takes away the Resistance within, and suffers the Pressure of the Air, and the Steam in the Blood-vessels to fill the Blood-vessels in the Sides of that Part of the Stomach or Guts, contract them, and force the Juices out of the Blood-vessels into the Glands in their Infides, and stock them there for Fermentation, Discharge, &c. There may be other Causes that contribute, such as the Thinness of the Blood, Cleanness and Openness of the Ducts into the Glands, cool Air to prevent the Steam from issuing too fast at the Pores, moderate Action, &c. If the Juices
be

be secreted in due Proportion, the Blood will be sweet and cool; if too few, the Blood will be too hot and sharp; if too many, the Excrements will be too hot and sharp, &c. as aforesaid.

S E C T. II.

Which hinders the Juices from secreting into the Glands, &c.

STEAM, which keeps the Sides of the Stomach and Guts too much extended, flattens the Blood-vessels, hinders the Blood from circulating thro' them in due Quantity, and presses the Glands, that the Air cannot drive the Juices into them; either by rising in too great Quantity, or by being too gross, or by the Straightness or Foulness of the lacteal Vessels; Thickness of the Blood, or frequently for want of Action.

S E C T.

SECT. III.

Which opens the Mouths or Valves of the Glands, in the several Parts, to discharge the Juices for the several Uses, &c.

INcrease of the Pressure of the Atmosphere, or Diminution of the Expansion of the Steam within, or the Corpuscles of Fire, Salt, or pointed Bodies applied in proper Fluids or Steam, with the Motion of the Fluids or Steam, or other proper Agents to impell or wrest them, to fret off the Coats or Phlegm, &c. which cover their Mouths with a sort of Skin, or to cleanse the stagnant Matter out of their Mouths, or to open their Mouths, by being pushed in like Wedges, or in extraordinary Cases, by taking off or thinning this outward Skin, cutting their Valves, or Sides, &c. It may seem strange to assert, that the small Corpuscles of Fire, or volatile Salts, can open the Valves of the Glands in the Stomach, &c. But if we consider that the Valves of those Glands, which we see or discover with Glasses, are composed of Glan-
des still smaller and smaller, and
Valves

Valves to them proportionable to the Magnitudes of the Corpuscles of Fire, Salts, &c. even supposing as smaller as we can imagine, and the Corpuscles which constitute the Juices in them still smaller, and that opening the Mouths of the smallest Glands discharges the Juices out of them, and weakens and opens the Valves of the Glands successively larger ; and that if the Corpuscles do but open the Mouths of the smallest Glands, till the Steam which before circulated into the Blood, get Vent at the Mouths of them, it will soon open the Valves wider, and that if small Bodies by rebounding, can expand and stretch the Vessels that contain them to any Extent, which any other Force can, the Operation will appear more practicable. The Consequences of their being opened too much, or continuing open too long, have been mentioned above.

S E C T. IV.

— *Which shut the Mouths of the Glands, &c.*

EXpansion, of the Steam within, Diminution of the Pressure of the Air without ; the Thickness or Closeness of the
the

the Glands within, and the Weakness or Openness of the outward Pores, Phlegm, or tough close Matter, which cover the Mouths, or stagnant Matter in the Mouths of the Glands, Corpuscles of some sorts of Matter, which they call Astringents or Stipticks, which dry or thicken the Juices in the small Valves, and scorch the Valves, and some blunt or flat ones, which are so figured, as to fit and stop their Mouths, or to be pressed against, and cover them, or, &c. That Corpuscles infinitely small can stop the Mouths of the Glands, will not appear so strange if it be likewise considered, that stopping the Mouths of the smallest Glands, which compose the Valves of the greater Glands, stops the Mouths of the greater, by hindering the Juices from being discharged out of the Glands, which compose the Valves of the greater Glands, and hindering them from opening. If when the Glands are full, the Steam can rise and extend the Stomach without emptying the Glands, it must cause a Sense of Fulness or Stitches and Pain, according to the Strength and Quality of the Steam.

S E C T. V.

— *Which raise the Steam, &c.*

THE Clearness of the Stomach of Phlegm, or such Matter as can sheath the Agents, sufficient Quantity of Heat, and proper Juices in the Stomach, or secreted into it, a due and proportional Quantity of Meat and Drink, stocked with a due Proportion of Salts and Spirits, and of Matter not too crass or vitcous, sufficient Action, sometimes they rise too fast by too hot or too salt Meat, too much spirituous Drink, too violent Exercise, Stoppages of the Passages or Pores where the Steam should circulate or perspire, too great an Addition of Heat, too great a Discharge of Moisture by hot Air, Fire, keeping off the Pressure of the Air in Bed, or by Clothing, which lets the inward Steam open the Pores, and keeps off the Motion of the Air, which bears off the Corpuscles of Heat discharged, and supplies their Places with Cold, sometimes by too great a Secretion of brinous Juices, or of Juices too sharp, into the Stomach and Guts. By the Effects upon the several Parts, Judgment may

may be made, whether the Steam rise in due Proportion, or too fast, or too crass, or too sharp. When the Pressure of the Atmosphere is strong, and the Air clear, if the Steam rise, and pass in due Proportion, the Blood in young healthy Persons, will circulate briskly, the Body be light and active, the Muscles strong, the outward Parts plump and smooth: If too fast it will inflame the Body, affect the tender Vessels in the Head, &c. discharge the Moisture too much at the Pores and Lungs, force off some of the finer Corpuscles of Blood with the Urine, make it red and hot, leave the Excrements hot and dry, make too much of the Blood appear in the outward Parts, cause bleeding at the Nose, &c. When to that Degree we call a Fever, the Steam exhales so much of the finer Juices, that it leaves not sufficient to extend the Glands, and distend the Muscles, and at the latter End when the outward Glands are empty, the Parts will be lank and withered; and when there is not Steam sufficient, or when 'tis too fiery, or penetrating to extend the Muscles, the Parts will move weakly and be sore, and move with Uneasiness or Pain. If the Steam rise much faster

faster than it can pass at the Lacteal Vessels, it will extend the Stomach and Guts till they be ready to burst, and frequently burst the Stays, or any thing which confines them, and passes the Place, and stop the Extension of the Lungs, and that which gets out, flies with such Force into all the Parts, especially the tenderest in the Head, that it stops the Senses till it gets Vent by Degrees, or something cool be taken into the Stomach to condense or clog the Steam. Whether this be the Cause of Apoplectick Fits, I have not had Opportunity to observe. Whether the Will, in any sudden Surprize of Joy, Fear, &c. can direct the Steam to the Stomach or Guts, and force the Glands suddenly to secrete a great Quantity of the Juices which are so volatile, I cannot determine. But when the Steam is put into violent Agitation, by Abundance of Juices flowing into the Stomach, by sudden Frights; and in several sorts of Fits, as soon as it begins to pass, the Persons are much stronger than at other Times. Where the Steam is raised too high by the Juices stopping the Glands, absorbing or sheathing the Juices, stops or lessens the Effect, and discharging from the
Stomach,

Stomach, or any other Way, takes away the Cause. *

S E C T. VI.

—Which binders the Steam from rising?

TOO much Phlegm, or other viscous Matter which entangles and overpowers the Agents or Juices; want of proper Juices in the Blood to secrete into the Stomach, Stoppages in the Glands, or something which hinders the Juices from secreting into the Glands, or out of them into the Stomach, want of proper Juices and sufficient Quantity in the Stomach, or the Presence of something which absorbs or blunts them; too much Meat and Drink, or too great a Proportion of Meat to Drink, or of Drink to the Meat; want of sufficient Quantity of Spirits or Salts, or the Presence of Matter which sheaths and entangles them, and is too crass to be born off by them; want of Action. If the Steam rise too slowly, either the Glands do not secrete brinous Juice enough into the Stomach, or

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* Let this be compared with the common Practice, and I believe the Success will prove what is alledged; tho' the Reason has hitherto been very obscure.

'tis not sharp enough, or there is a Load of tough cold Phlegm which goes not off, but stops the Glands, and entangles the Salts. If it be Phlegm, in a Morning when your Stomach is lank, and you lie upon one Side, you will feel a Load or Pressure there; or if you drink a good Quantity of spirituous Drink, or use violent Action, and the Stomach do not extend, or the Blood circulate briskly, 'tis likely the Glands secrete too much Phlegm into the Stomach, or you have a great Load of Phlegm there, and that, if not discharged, will in time make the Excrements and all the Juices of the Body tough and crass, the Passages and Glands foul and straighter, your Blood move slowly, your Body weak, dull and inactive. Nature fences against the Effects two Ways, by making the lacteal Vessels straighter, the less crass Matter can go into the Blood, and makes the Defect supply a Cure. For as we then need more Salts to divide the Matter in the Stomach, increase and excite the Steam, the Passages for secreting the Urine, and the Pores are straightned by the Phlegm, and thereby the Salts are prevented from secreting, and the Water is only permitted to pass thin and clear. The Salts retained
are

are employed till they be able to digest the Phlegm, increase the Steam, and clear the Passages, which generally creates a Struggle, and as 'tis effected, the Water secretes salt, foul, and turbid.

S E C T. VII.

— *What make the Steam pass.*

THE Rarification of the Steam, the Abatement of the Pressure of the Atmosphere, the Thinness of the Matter in the Guts, the Cleanness of the Sides of the Guts, the due Wideness and Cleanness of the Lacteal Vessels, the due Thinness of the Blood, a due Strength in the Muscles of the Heart and Valves; the Cleanness and Openness of the Capillary Vessels to let it perspire, or pass to the Bladders in the Lungs or Pores in the Skin, the Thinness and Cleanness of the Skin, and Openness of the Pores; a pure cool Air to bear off the Steam from the Lungs; moderate Action of all the Parts; to which I may add Sleep, in a warm Place or Cover, that rarifies the Steam, thins the Fluids, and stocks or replenishes all the Parts therewith. If the Blood move briskly, and the outward Parts be

lank, either the Capillary Vessels are full of Matter so crass, that the Steam cannot enter, or the Pores are too open, and let it pass too quickly out. If the Blood move briskly, and the outward Parts be too full, either the Blood is too thick, and passes not the Capillary Vessels, or the Steam vents not at the Pores, as it happens when you put your warm Hands into cold Water, the Steam is stopped from venting, the Parts extend, and you feel a burning Heat within them; or when too much Cold has stagnated the Juices in the Parts, the Steam inflames them. When you have had a free Stool, the crass Excrements in the upper Guts will be pressed downward, succeed those discharged, and thinner Fluid will succeed from the Stomach into the upper Guts, and the greater Length of the upper Guts, is only partly filled with thin Matter, or almost empty, the Steam will have freer Vent, the Stomach settle, the inward Heat abate, and the Blood move quicker. And when the Glands which secrete the Juices for discharging the Excrements are emptied, the Lacteal Vessels may extend, and be opened wider, and let the Steam pass in greater Quantity.

S E C T. VIII.

— *Which hinder the Steam from passing, &c.*

THE Crassness of the Steam, or its being loaded with Matter not sufficiently divided in the Stomach or Guts, the Crassness of the Matter in the Guts, which stops or clogs it as it passes through, the Phlegm upon the Sides of the Guts, the Straightness of the Lacteal Vessels, or their being stopped with phlegmy Matter, the Crassness, or Thickness of the Blood, the Weakness of the Muscles of the Heart or Valves, which lets go the Steam before it be raised to a due Force, the encreasing the Pressure of the Atmosphere or Cold, the Foulness of the Bladders in the Lungs, a thick foul Air, the straightness of the Capillary Vessels, the Crassness of the Matter in them, the Straightness or Foulness of the Pores. If the Steam customarily bear off too much Phlegm, it and the Blood will move heavily, the Body will be cold, and the outward Parts of a phlegmy Colour, &c. If the Stomach and all the Guts be extended, and the Blood move not briskly, either the

Steam is too gross, or the Matter in the Guts is too crass, and the Agents huff and extend them as Leaven does Paste, or the Lacteal Vessels are too straight, or foul, or swelled, or stopped by the Fullness of the Glands, &c. or the Blood is too crass, or thick, or tough, and the Meat will be a long Time in digesting and going off. If the Steam rise not in Quantity sufficient, or be obstructed, so that the Blood move weakly, the outward Parts will be lank, and the Skin flabby or wrinkled.

S E C T. IX.

— *Which stop the Passages in the Guts, or shut their Valves.*

THE Sides of the Guts being clogged with tough Phlegm, and they thereby straightned, or large Masses of Phlegm going off from the Stomach at once, and making almost total Stops, the Toughness and Ropiness of the Excrements being not sufficiently digested, the Coldness and Toughness of the Phlegm and Excrements, which raises little Steam, but entangles and weakens the Agents, which should extend the Guts, and suffers the
Blood

Blood and Juices to fill the Vessels and Glands in the Sides of the Guts, and thereby contract and straighten the Guts, and swell and shut the Valves, and hinder the Agents from opening the Mouths of the Glands, and the Juices from issuing for Digestion and Discharge; or the Thickness or Thinness of the Blood, or the Straightness or Foulness of the Ducts, which hinder the Juices from secreting into the Glands in the Stomach or Guts, or dry blunt Corpuscles which absorb or blunt those Juices, and hinder their Operation, or stop the Mouths of the Glands; or stiptick Corpuscles which dry or scorch the Valves of the Glands, the Steam and impelled Juices within the Ducts and Glands; which extend and swell the Parts for want of Discharge, the violent Fermentation of the Stomach, which bears off all the Humidity out of the Guts, and leaves the Excrements dry; Heat with Action or Motion of the Parts, or Body by Fire, Cover with Clothes, lying too long or too hot in Bed, Spirits, most Bitters, and every thing which encreases Heat, or goes off in hot quick Steam, and carries the Fluids too quickly off. If the Matter in the upper Guts be too crass and thick or dry, that the Steam cannot pervade

vade or dissolve it, the Stomach may extend, and the lower Guts may not. If there be one or more Stoppages in the upper Parts of the Guts, by great Quantities of Phlegm gone off the Stomach in Masses, the Stomach and Guts above may be extended, and the Pulse abated, and the Steam may force upward, open the Valves, and make you vomit. And as soon as the Fluids are gone off in Steam from the Excrements below the Stop, or any of the Excrements are discharged, which rarely happens in Quantity while there is a Stop, the Guts below will be lank, and as often as the Steam above breaks through or forces by the Stop, or the Fluid succeeds it, into the vacant Room in the Guts below, it causes a grumbling Noise as it passes along. This Noise may happen at the Valve of the *Pilorus* or *Colon*, or in passing by the solid Excrements below, but not in the small Guts, unless they be twisted or stopped. Keeping the Stomach too much or too long distended, stretches the small Vessels that constitute the Sides so much, that filling or extending them with Blood, Juices, &c. will not contract the Stomach to the usual Degree. Some have thought that when there is a Stop, or any other Cause, which makes the Stomach extend
too

too much, it may make it press the great Artery behind it, and hinder a due Proportion of the Blood from descending; but if the Stop be not near the Stomach; and there be no great Obstruction in the Passage of the Steam, the same Force which extends the Stomach, extends the Artery, and drives the Blood. But if there be an Obstruction near the Stomach, and the Steam issue not out in due Proportion from the Stomach, or from the Guts below the Stop, the Blood will move slower, and the Pressure of the Atmosphere will prevail over the Strength of the Steam, and press a greater Share of the Blood into the inward Vessels; and though indeed the Blood will be less expanded, or in less Compass, yet perhaps ^{See above, p. 112.} the Arteries will be more distended than when the Steam issues briskly, and the due Share of the Blood is outward. *

* This seems to be a more mechanical Account of the common Apoplexies than that from a Repletion of the Stomach, and its Pressure upon the *Aorta*.

SECT.

S E C T. X.

— *Which open the Passages in the Guts
or their Valves.*

SOME Juices involuntarily secreted or discharged out of some peculiar Glands, out of the Stomach or Guts, or out of the Gall-Bladder, *Pancreas*, or perhaps from several of them jointly, or from several Parts for the several Valves which open the Mouths of the Glands in the Guts, as they descend and let out the Juices and Steam which insinuate between the Plaits of the Valves, and make way for the rest, or that opens the Mouths of the Glands of the Valves, and makes them secrete the Juice, and Steam which swelled and extended them, and at once lessen their Magnitude, weaken their Force, and by the issuing, Juice and Steam, repel their Infides from one another; and as the Juice and Steam issues and empties, the Glands at once expand the Guts, suffer them to extend or widen, and makes all their Sides supple. During this Action, you feel a soft Tickling descending all along down your lower Guts, and the Force of the Steam is employed

ployed to discharge, and the Force of the Muscles which move voluntarily. The hard Excrements of every Creature, when they are discharged, have more or less of these Juices on their Outsides, and after they are discharged, generally a small Quantity of those Juices follow; when the Excrements are discharged soft, those Juices are mixed and not so visible, tho' 'tis likely they are in greater Quantity. 'Tis said some People collect the Juices which are discharged after, and swim upon the Excrements of Cattle in *May* or *June*, and drink it to purge them, and that it does it effectually. All Creatures strain to discharge those Juices after the Excrements, and if a Man do not discharge them, they will in Time occasion the Piles. I pretty much doubt whether it be the Excrements which remain in the Guts, or the volatile Juices and Salts discharged out of the Blood, which smell when they are discharged by Stool. I think when one is costive, and few Juices discharge out of the Blood, the Excrements smell little or scarce at all. In healthy Persons, where there are no accidental Motives, nor Impediments, 'tis likely the Glands secrete regularly, according to the Rules aforesaid, and when they are

are full, discharge almost periodically. And as those Juices are sometimes discharged other Ways, or obstructed in secreting into or out of the Ducts or Glands, and are too few or too inactive, or meet with Phlegm or Obstructions, which entangle or blunt them, or defend and keep them off the Parts where they should act, so on the other Hand, they secrete into and out of the Ducts, Vessels, or Glands too fast, in too great Quantity, or are too active, or there are other Juices in the Stomach or Guts which they excite, or the Mouths of the Glands are too open or too naked and defenceless, or too much opened, or they secrete too much, or too active Juice also, or the Steam is too strong, and hurries off the Excrements too fast, and sometimes the Juices wound the Glands, till they discharge even the Blood itself. The Juices may become too sharp or salt by the Straightness of the Ureters, &c. which will not let a due Share of them pass. And when the Blood is saturated with such Juices, the Glands will secrete them into the Stomach and Guts. And in a Morning when your Stomach is lank, and you lie upon one Side, you will feel a burning, gnawing Heat on the under side of your Stomach,

Stomach, and the Steam will go off hot, and cause a burning Heat in the Parts, and the Steam so loaded with Salts, will open the Mouths of the Glands in every Part where it passes, make them secrete continually too much, and so by Degrees emacerate the Body. If they bear too great a Proportion of Oil, they have the contrary Effects. The Excrements can be fermented or mixed with Juices, till they be exceeding sharp and hot in the Guts, and that they scorch or fret the End-Gut and Fundament as they are discharging, and 'tis likely they can open the Glands in all the Valves, and with the Assistance of the Steam, force their Way till they are discharged; but whether the Excrements can be fermented to such a Degree, that the Corpuscles freed out of them, without a Mixture of the Juices secreted out of the Blood, can open the Glands in the Valves, and assist in discharging themselves out of the Stomach, or any Part of the Guts, I cannot tell. When one has a free continued Looseness, the Excrements are whitish, and either some white Juices return out of the Blood, or the white Juices we call the Chyle, are not discharged out of the Excrements, or the Excrements are of that Colour,

Colour, when they are fermented to such a Degree, and are discharged at that Degree, like Ale, which is white when working, and after brown. When such a Looseness has continued for some Time, so that the Tension of the Guts is weakened, the outward Parts will be contracted, the outward Veins visibly straightened and made smaller, and the Kidneys being less compressed by the Steam within the Guts, and the Vessels and Glands in them being suffered to extend, they will secrete the Urine thick and muddy, and 'tis likely the Liver and *Pancreas* being less compressed, will secrete a greater Quantity of Juices, or Juices of a grosser Consistency, and 'tis found by Experience, that the Corpuscles in several sorts of Meat and Drink, in Simples, Minerals, &c. stop the Glands which issue the Juices to open the Valves, or entangle or absorb the Juices or Agents which are called by diverse Names, viz. - - - - -

Abfor-
bents, En-
crassants,
Aggluti-
nants, Bra-
cers, &c.

And the Corpuscles in others open their Mouths, or excite some latent Juices in the Stomach or Guts which open them, and make them discharge their Juices and discharge their Excrements, which are also called by various Names, according to the Quantity of Corpuscles in each, or the Quantity

Quantity given at once, as Openers, Purges. And when the Glands have been stopped for any considerable Time, upon their being opened, the Juices will flow up in greater Quantity, and have more forcible Effects. And when they have been forcibly opened by Physick, or any other Accident to secrete their Stock of Juices, and what would afterwards pass out of the Blood, they secrete not naturally for several Days. And the same Agents have the same Effects upon the different Parts of the Body, outward or inward, in Proportion to the Degree of Force which moves them, the Thickness or Thinness of the Skin or other Defence, the Strength or Weakness of the Glands, the Wideness or Straightness of the Valves, Pores, &c. And different Agents or different Quantities, or moved with different Force, open the Valves or Pores, and let the Juices be pressed out in any Part; some, those in the Mouth to discharge the *Saliva*; some, those in the Stomach to discharge the Bile; some, to blister or take off the outward Skin, &c.

S E C T.

S E C T. XI.

— *Which open the Passages and Valves, where the Urine secretes.*

COLD Meat, or weak spiritless cold Liquor, which abates the Steam in the Guts, takes off the Pressure upon the Kidneys, lets their Ducts open : cold Air, which shuts the Pores, and prevents the Fluids from perspiring, Salts or sharp Corpuscles, which cleanse the Glands in the Kidneys, and so render them wider, or which open the small Glands in the Sides of those Passages, and make them secrete the Juices in them, and thereby render the Passages liable to be extended or widened by the Fluids and Steam, and enable them to discharge the Phlegm, Salts, Gravel or Stone, which stopped or swelled, or straightned the Parts, and afterwards thicker Urine. There are acid Corpuscles in some Fluids like those in Rennet, which by their Smallness or Figure seem to be adapted to divide or thin Fluids, and let the grosser Corpuscles subside and precipitate, and thereby render the Fluid thinner, and more liable to be secreted by Urine. When the Water is secreted

secreted into the Bladder, and we open the Valve in its Neck, which seems to be done partly voluntarily, the Steam in the Guts presses it out, pushes down the End-gut (and if it be open) breaks backward; and when it gets Vent in Quantity, the Water issues weakly. When the Steam presses the Excrements, and gives us an Inclination to a Stool, the Pressure of the Steam, which rises to discharge the Excrements, presses the Bladder, and gives us an Inclination to discharge the Urine; we discharge the Water first, and that gives the End-gut Liberty to extend farther, and make Passage for the Excrements. When these Passages are too wide, or open, they drain too much of the Fluid thin Parts out of the Blood, and carry off the Juices, which should be reserved for other Uses, and quickly disorder all the Operations in the Body.

S E C T. XII.

— *Which straighten or shut the Passages
or Valves, when the Urine secretes.*

THE Extension of the Steam in the Guts, which compresses the Kidneys, and straightens the Ducts, the free Passage of the Steam, and Openness of the Pores, which discharges most of the Fluid that Way, Phlegm or any Sort of glutinous Meat or Drink, which fouls, or Salt, Gravel, Stone, &c. which corrodes or frets the Glands till they swell, Absorbents or blunt Corpuscles, which hinder the Agents from opening the small Glands in the Sides of the Ducts. When the Steam is so strong in the Guts, that it not only prevails against the Pressure of the Air, but extends and stretches the Muscles of the Belly outward very much, the Blood being resisted only by the Strength of the Pressure of the Air, and the Skin in the outward Parts, a greater Share of the Blood will pass that Way, and less through the Kidneys. The Kidneys will be violently compressed between the Sides of the Guts, by the Expansion of the Steam in them; and the Arteries, Veins,

Hence the
Disorder
commonly
called the
Windy
Gravel.

Veins, Ducts and Glands in them contracted and straightned, the Water will pass thinner consequently, and in less Quantity. When any considerable or total Stop is made there, or in any of the Passages for the Urine below, the Blood-vessels are presently filled too full, the Blood becomes of a Consistency not fit for Circulation and Secrecion, the Steam cannot get Vent for want of Space to move the Blood in, but recoils, throws up the unnatural Juices secreted into the Stomach, causes Vomiting, and at last Fevers, &c. The Milt, or Spleen, seems to be under much the same Circumstances as the Kidneys, liable to be extended when the Steam in the Stomach and Guts is weak, and compressed when it is strong: Whether the Pain there be occasioned by its Extension, when the Steam is weak, or Compression, when the Steam is strong, I have not had Opportunity to observe: Nor whether the Discharges out of the *Pancreas* be occasioned by the Weakness of the Steam in the *Duodenum*, and the Extension of the Steam in the other Parts, or by the Weakness of the Steam in all the Parts, or the Juices are pressed out of their Glands by the Strength of the Steam in the Stomach, or jointly

in the Stomach and Guts. Whether the Liver, which is chiefly supplied with Blood by the Pressure of the Atmosphere, when it is compressed by Steam, in the Stomach and Guts, stronger than the Pressure of the Air, admit a due Share of the Blood to return from the lower Parts of the Body through it, or deny Admission, and keep the lower Parts extended and too full; or whether it then circulate a due Quantity of the Blood in itself, and secrete a due Quantity of Gall, and whether, when the Steam within is weak, the Liver do not extend, admit a greater Quantity of Blood, and secrete a greater Quantity of Gall, whether its Extension cause not that Pressure we sometimes feel about the Stomach; whether it discharge the Juices out of the Gall-Bladder, when the Tension of the Guts is weak or strong, I cannot tell. But 'tis likely if those Juices be intended to encrease the Ferment, they are contrived to discharge when it is weak, if to abate the Ferment, to discharge when it is strong.

S E C T.

S E C T. XIII.

A State of the Operations in an healthy Person, how varied when empty, full, &c. In the various Positions of the Body in Rest, in Action, the various Effects of Meat, and Drink, composed of different Sorts of Corpuscles, or differently freed.

WHEN you have an Inclination to eat and drink, you feel a Lankness, Lassitude or Feebleness in all the outward Parts, and a Gnawing or Sharpness within the Stomach; the first occasioned by the Defect of Steam to move the Blood quickly, and distend the Parts; and the latter by a brinous or salt Fluid remaining at the Bottom of the Stomach, which remaining in the Glands, and secreting out of them, fall down to the Bottom of it, and raises the Sensation of Hunger, or what we call our Appetite. Suppose there is some small Quantity of Phlegm lodged in the Stomach, or swimming upon that brinous Matter, that the Guts, or the several Divisions of them are partly filled, the lower Parts of undige-

sted crass Matter in Form of Excrements, and the upper Parts of a thinner Matter composed Part of excrementous Matter and Part of Fluid, and the uppermost Parts of Steam or empty, and the whole mixed with Salts, the Juices of the Gall, Pancreatick, &c. And that the lower Parts are extended with Steam, and hang in Folds or Bends, like Bags, and that the Stomach, upper Guts, &c. are lank, contracted and compressed by the Extension of the Guts below, into a little Compass, suppose the Body standing, or sitting at Rest, the common Quantity of Meat you chew and swallow, is mixed with the *Saliva*, goes down into the Stomach, and rests in a Mash upon the Phlegm and brinous Fluid, if there be any considerable Quantity of the brinous Fluid, the Meat and Phlegm partly immerses in it. When you have drank the common Quantity of any thin Fluid sufficient to dilute the whole, if the Fluid be warm, most of the Oil or melted Fat (if there be any) rises to the Top, most of the Phlegm next under it, next the Parts of the Meat which will swim in that Fluid, and next the Fluid with the Parts of the Meat near its own Gravity, hovering or settled to the Bottom in it. If the Fluid
be

be cold, the Oil and Steam will be stor-
kened and entangled among the Mash,
till the Steam and Heat thin them; Part
of the brinous Matter will be entangled
in the Oil, Phlegm and Meat, and Part
disperfed in the Fluid, (which will sheath,
or difperfe the Salts, and take away the
Sense of their gnawing upon the Bottom
of the Stomach) in the fame Order as
they would be if they were put into a
Bag kept in the fame Degree of Heat,
and moved with fuch a Motion as the
Lungs give to the Stomach. When the
Salts are fo difperfed they free others, and
by Degrees open moft of the Glands in
the fides of the Stomach, and 'tis likely
the brinous Juice continues to fecrete, till
the Ferment extend the Stomach, and
put a Stop to the Secretion. When you
have filled the Stomach too full, or over-
charged it, fo that the Agents or Juices
cannot rife into Steam in a fhort Time, or
if you quell them when they are begun
to act, it will make too great a Quantity
of Juices iffue into the Stomach, and at
laft raife too great a Ferment, and caufe
too great an Extenfion. * For a little

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while

* It is highly probable, that the Shuddering or Horri-
pilatio preceeding all Fevers and acute Disorders, proceeds
from this fame Cause, and not from the Obstruction of the
Capillary

while after we have eaten and drank, we find a Coldness in the outward Parts, and a Heaviness or Inactiveness in the whole Body, because the Corpuscles of Cold in the Meat and Drink put a Stop to the Steam, and condense it totally in the Stomach, and partly by Pervasion in the Guts. A while after, as soon as they have fermented a little, the most volatile or lightest Parts go off in Steam, extend the Parts, thin the Blood, and put it into Motion, and give a Lightness, Briskness, Heat and Strength to the whole Body, and sets forward the several Secretions at the Lungs, Pores, Ureters, &c. At the beginning of the Ferment, as I said, the most volatile Parts go off in Steam; when the Ferment is high, the volatile Parts go off full loaden, especially if there be much Meat, and so prevents too great an Hurry in the Blood; when the Ferment abates, it goes off less loaden, and more able to move the Blood, and so keeps the Motion nearer equal, though it does not expand the Parts so much. If one have rested long in a cold

Capillary Vessels, as is generally taught; their first Symptoms manifestly shewing the Attack to be begun in the *Primæ Viæ*, and perhaps then is the Struggle with the Agents, as Sickness, Nausea, Vertigo, Vomiting, Gripping, Diarrhœa, &c.

cold Place till one's outward Parts are very cold, and one eat and drink in that Condition, soon after the Stomach and Guts will extend very much, because the Steam cannot suddenly thin the Blood, extend the outward Vessels, open the Pores, and get Passage as it does when the Body is warm. As the Meat at the Bottom dissolves in the Fermentation, the Corpuscles and Fibres of it still rise up into the Fluid, and possess each their several Place according to their Gravity, till the Fermentation thin, and the Steam bear off almost as much as it can, and it begin to abate, the Blood and Juices press into the Sides of the Stomach and contract, and the Steam in the Guts below lifts up its Bottom, and the Mash, as it comes to the Level of the *Pylorus*, is discharged into the Guts, and the Remainder (which in an healthy Person I think is very little) subsides and lodges in the Bottom of the Stomach, and every Thing becomes in the same State as when you first began. When one lies down with a full Stomach, several Positions alter the Case. If one lie upon the right Side, the Matter, which in a standing or sitting Posture was at the Bottom of the Stomach, will then be upon the right Side of the Stomach,

Stomach, and upon the *Pylorus*, the rest succeeding each in their Order, (and the Phlegm and Oil uppermost) towards the left Side of the Stomach, and the Vacancy extended with Steam there. When one lies upon the left Side, the Contents of the Stomach are inverted, and the Vacancy extended with Steam is on the right Side, and to the *Pylorus*: When upon the Back, the Parts of the Contents, which possess the lower Place, settle thither, and those which emerge to the fore-side of the Stomach then uppermost, and the Vacancy filled with Steam is on that Side, and the Fluid lies with one Side to the *Pylorus*. If one lie on the right Side, the heaviest Masses of the Meat may go down first undigested into the Guts: If on the left Side, nothing but what goes off in Steam can go out at the *Pylorus*, till the Stomach be lifted up, and contracted: If upon the Back, the Steam may go off above, or through the Fluid out at the *Pylorus*, much in the same Manner as when one sits or stands. When the Meat and Fluids are digested, and gone off, if any of the brinous Matter remain, or be secreted in considerable Quantity into the Stomach, it corrodes, and causes a burning Pain on the Side
of

of the Stomach you lie upon, which is not so able to endure it as the Bottom of the Stomach. If one lie on the right Side they may go off at the *Pilorus* into the Guts, pass with the Steam, and cause a burning Heat all over the Body. If there be much cold Phlegm remaining, it presses and lies more uneasy upon any Side of the Stomach than it does at the Bottom. And if one lie upon the right Side, if the *Pilorus* be open, it may go off, stop in the Guts or in the Mouth of the *Pilorus*. When the Side of the Stomach that lies undermost is uneasy, we naturally change Sides. I think Cattle constantly lie upon their right Side. It deserves Consideration why they all lie on one Side, and Observation how their *Pilorus*, &c. is placed; how other Creatures lie, &c. and also how the Lungs, Liver, &c. press upon the Vessels, in which the Steam passes from the Guts to the Blood-vessels, when one lies upon the left Side, which is supposed to be the Cause why one sometimes rises so oppressed. Whether a Quantity of Phlegm be necessary to remain in the Stomach when the rest is discharged; or, whether any of the Glands of the Stomach secrete a mucous Matter to prevent the sharp brisous Matter from corroding

corroding the Stomach, when one fasts long; and whether that raises any considerable Steam, or the Fluids in the Guts supply the whole, deserves to be considered. Since a Man may fast till his whole Body be almost wasted away, it seems very likely, that such Matter is secreted into the Stomach, and there dissolved till it go off mostly in Steam. If the Coats of one's Stomach and Guts, when irritated by Salts, or &c. can discharge Juices in the same Quantity, as the Glands in our Mouths when irritated can, the Proportion of their Extents considered, there may be several Pints secreted into one's Stomach and Guts in an Hour. Perhaps when one sits still, or uses very little Exercise for some Time, the lightest volatile Matter, which assists in digesting the Meat, for want of being tossed and mixed with the Meat by Exercise, goes off too soon, leaves the Meat undigested, and occasions what we call Vapours. And when there is a great Quantity of Steam raised from the Stomach, and secreted through the Brain into the Nerves, and not discharged by Action of the Muscles, it may distend them too much, or make Obstructions to the Secretions there, and disorder the Sense of the Brain. Whether

ther the Matter which occasions those painful Swellings, &c. which we call the Gout, and some nearly resembling it, be lodged in the Blood-vessels, or Nerves and Muscles, I have not had Opportunity to observe and distinguish. When the Body is put into Motion by riding, or into Action by walking, running, or any sort of Exercise, the Matter in the Stomach and Guts is tossed about, inverted and mixed, and the Fermentation mightily encreased, and the Steam emitted in greater Quantity, and with greater Force, in Proportion to the Motion or Action, and it circulates the Blood with greater Speed, quickens the Motion of the Lungs, makes a greater Discharge of Steam there and at the Pores; in violent Exercise, especially if the Party use it not frequently, and the Parts be not widened by Use, enflames and extends the Body, sending out the Steam faster than the Lungs and Pores can discharge it; and if the Matter that supplies the Steam be sufficient, and the violent Exercise continued, at length the Parts will be so extended with Steam, that small Quantity can issue out of the Stomach and Guts, and they will extend, stretch the Midriff, and cause Stitches; the Blood will be disabled from circulating,

ting, a Stop put to our Motion, &c. till by resting, the Steam by Degrees get Vent at our Lungs, Pores, &c. and afterwards from the Stomach and Guts; and as that is effected, the Blood by Degrees circulates, the Heat abates, our Strength recovers, &c. The Stomach and Guts act like a Still; when there is not Heat enough, it runs Water; when enough, Spirits; when too much, Spirits and crass Matter; when there is very much Heat, or the Pipe stopped, the Head flies off, or it bursts. As moderate Exercise taketh gradually heightens the Ferment of our Stomach, removes the Obstructions in the Vessels, opens the Pores for Perspiration and Respiration, so the Strength of our Body is in Proportion to the Quantity and Duration of the Steam, which the Stomach and Guts can emit, the several Tubes admit, and the Lungs and Pores discharge, and never fails, till the Guts fail of supplying, or the Nerves or Muscles of secreting, admitting and remitting, or the Lungs and Pores of venting them. And when any one of them fails, it fails in Proportion; if so, little more need be said in Commendation of moderate Exercise. And though a Man by cleansing his Body at first, and using proper Diet,

viscous

viscous Meat, and old well mixed Drink, whence the Steam rises regularly and equally; and takes this not all at once, and little or no fresh food before the last be digested and born off, with Sweats and Action, by Degrees may bring his Stomach to supply, and open the Passages, and Pores to transmit and discharge sufficient Quantity of Steam to enable him to endure long and violent Exercise; yet if a Man, whose Body is not so prepared, use violent Exercise, it will throw out the Phlegm or what is in the Stomach, into the Guts, and the Steam will extend the lacteal Vessels, force off Phlegm or crass Matter, when 'tis melted or divided with excessive Heat into the Blood; and the Violence of the Motion of the Steam, and the Corpuscles of Fire and Salts in it, will tear off and dissolve, or melt the Fat or tender Parts of the Body, and bear off too much of the Serum, or finer Parts of the Blood; so that when he comes to rest, and that Matter in the Blood to cool and storken, the common Force of the Steam will not be able to circulate it in the Blood, nor force it through the Capillary Vessels, nor secrete it by the Pores, Ureter, &c. During Sleep or Rest, some of the Matter will be thrown off by the Lungs,

Lungs, foul the Tongue, and make it white, and the crassest of the Matter will stop in the Capillary Vessels, and most commonly fall down upon the Legs, cause Swellings, Dropfies, &c. and if there be any Quantity of acrid Matter, or sharp Salts in it, cause Pains, Inflammations, &c. and sometimes Stoppages and Pains in the Side, which they call Pleurifies, &c. and if in less Degree, make the Blood move heavily, the Person dull, &c. * Whether that flackering Motion, we sometimes feel in our Parts, be Air collected together, so that when pushed by the Steam it recoils by its Elasticity, or whether 'tis some Steam that gets Vent out of the Nerves or Muscles irregularly, or whether 'tis something that the Steam has born off when it was too high, or when there were some Stoppages, deserves to be considered; whatever it is purging takes it away. When one is violently heated by Exercise, drinking any considerable Quantity of strong Spirits, raises the Steam more, and heightens the Flame. While spirituous brisk Steam goes off, little Sweat hangs upon the Body; when it

* The Aurarefrigerans, or that wonderful Prænuntium of Epileptick Fits, hitherto unexplained, and even unattempted, seems of this Kind.

it is spent, the Sweat is cold and watery; and afterwards there issues little or no Sweat. If when hot with Exercise, one drink strong old Beer, or Ale cool, where the Spirits and vegetable Matter are well mixed, though at first it cause a little Stop, the Spirits by Degrees go off, and keep all going; but if thin weak spiritless Liquor cold, the Corpuscles of such Cold, Fluid, clog the Corpuscles of Fire, Salt, &c. and stop or condense the Steam suddenly; the Air presses Corpuscles of Cold in at the open Pores, the Blood and great Quantity of Matter in it thickens and storks for Want of Steam to thin, drive and secrete it, and if not suddenly assisted by hot Spirits, Action, Friction, or Heat stagnates, settles upon the Parts, and oversets the Frame. When, in Action, one drinks Water cold, it condenses the Steam in the Stomach, and makes the Glands secrete, and those Juices bear off the Water which does not entangle them, as cold Juices, &c. do, and makes one Sweat presently; partly by the Humidity of the Steam, but chiefly for Want of Strength to bear it off the Skin. Resting suddenly from such violent Action in cool Air, has frequently the same Effects as drinking cold weak Liquor; and

in lesser Degrees of Heat by Action proportionable Effects. And one who has for some Time used violent or considerable Action, and afterwards on a sudden uses little Exercise, or Rests, will find some such Inconveniences. And one who has been accustomed to drink much strong Drink, and eat high Food, and afterwards on a sudden uses weak Drink and Diet, will find the same Effects, and the Steam will not be strong enough to circulate the gross Particles forced into the Blood-vessels by violent Exercise, strong Drink, &c. * And if the Steam in the Stomach be so weak, when there is any Matter in the Blood which is offensive, that the Pressure of the Air without can drive a great Quantity of it thither, it causes Disorders, which they call Gout in the Stomach, &c. and is expelled, by heightening the Steam in the Stomach, by something which is strong and astringent, to keep that out which is out, and expell that out which is in.

Removing

* And this is a clear and mechanical Account, not only of the Gout, but of all Disorders, whose salutary Crises are made by Eruptions or Efflorescencies; and whose fatal Exit depends, either upon want of this Steam to help them out, or (what from this appears most plainly) any sudden Check overpowering it, which drives them back, i. e. the Matter forming them.

Removing from Place to Place, Motion of the Air, &c. prevent one's drawing the Air, one has breathed, and gives one Opportunity to breath fresh. But I think, there is this Difference between Agitation of the Body by riding, &c. and Action of the muscular Parts of the Body, that riding dashes the Contents of the Stomach against the Sides, makes the Juices secrete, encreases or raises Steam from the Contents of the Stomach, faster in Proportion than it opens the Pores, &c. to discharge it, than muscular Action does. Action, especially of the Arms and Body, not only raises the Steam, but by the Stretches and Contractions of the Muscles of the Belly, &c. as one may say, squeezes the Steam out of the Stomach and Guts, and employs it, not only to circulate the Blood, but to distend the Muscles, and emits or perspires a greater Share of it through the Nerves, than Riding does. And all the Parts which squeeze the Glands in Action, as the Armpits, Joints, &c. issue a greater Proportion of Juices than they do in Riding. Walking gently without any Action of the Arms, or Body, does not renverse the Contents of the Stomach, nor dash it against the Sides, nor contract and distend the Muscles of

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the Belly, &c. and will make one faint or tired sooner, than five times the Exercise would do, where the Steam is raised and squeezed out by the Action of the upper Parts, Muscles of the Belly, &c. I know it has been said, that Walking does not distribute the Blood equally to all Parts of the Body, and so for Want thereof we become faint. But if one employ the Arms and Muscles of the Belly to the same Degree of Strength, and let the lower Part sit still, one will not be faint in twice the Time. And though Riding may perhaps be of Service to People in some Circumstances, yet it will never bring a Man to that Strength and Ability to endure violent Exercise, as muscular Action will. And these Differences ought to be well considered by those who choose Riding, or Walking, or bodily Action to preserve or recover their Health or Strength. * The Effects of Drink with common Action are different, according to the various Compositions and Quantities. Water, if pure, is only a simple Fluid, and serves for diluting other Matter put into the Stomach. If too little of it, the Agents cannot act freely in Fermentation, but will splutter and huff

* And also by Physicians when they prescribe Exercise.

huff like fermented Dough. † And too much of it removes the Agents to too great Distances, and weakens their Power in Action; and the Corpuscles of Fire, Salts, &c. are not able to bear it all off in Steam; but when they have born off as much as they can carry with them, the rest remains a cold inactive, spiritless Fluid, and most of that which goes off, secretes by Urine, little by Steam at the Pores, and the Steam moves slowly, and drives the Blood slowly. If a due Quantity, as it has little in it to ferment, or for the Salts to work upon, or be sheathed in, their Action will be upon the Meat. Liquors, that have a great Quantity of Spirits, in a thin Fluid, suffer freely, and assist the Agents to dissolve the Meat, and rise into Steam quickly, thin the Blood, and make it move briskly, support the Parts by extending them, make the Body light for a while, and go off in a short Time. Liquors, that have a great Quantity of Spirits, duly mixed with a good Quantity of vegetable Matter, and incorporated so, that they go off together, taken with Meat at the Beginning, sheath the Agents, and loose the

M 3 Appetite,

† Qn. Whether this be not the truest Account of the ill Effects of too frequent Tea and Coffee drinking.

Appetite, and slacken their Force, that they cannot dissolve so much Meat, nor so soon; but raise Steam fast enough to move the Blood quick enough for a long Time. It does not the Blood too much, moves the Humours, Fluids, and Solids which should stay, wastes not too much at the Lungs nor Pores, nor secretes too fast by Urine, makes one stronger, and enables one to endure hard Exercise for a long Time. Gross, heavy, spiritless Liquor abates the Activeness of the Agents and Juices, makes the Steam grosser, the Stomach and Guts extend, more of the Excrements discharge downward, and in Time stagnates the Steam, makes the Blood inactive, and fall down upon the Legs. Thin acid Liquors, which have been fermented very high, or kept a long Time, and contain but a small Quantity of Spirits, do not raise the Steam much, but open the Glands, and carry some Juices into the Blood, or secrete them there, and tho' they be drunk moderately, if constantly, do something which occasions Rheumatisms, Gouts, &c. spirituous and sharp Liquors, such as old thin French Wine, Champain, &c. thin and subtilise the Juices of the Body too much, divide the Meat too small, so that

that most of it passes into the Blood, and little by Stool, and when too much of that which should pass by Excrement, is thrown into the Blood, it falls upon the Feet and extreme Parts, makes them full and hot, if in great Quantity, causes Rheumatisms, Gouts, &c. The Quantity of Spirits commonly taken in the other Fluids into the Stomach, being freed from gross vegetable Matter, goes off quickly in Steam, quickens the Motion of the Blood for a short Time, perspires, and leaves the rest, rather less active than before. If one drink a great Quantity of Spirits, unless there be a great Quantity of Fluids, or Matter in the Stomach, they rise into Steam quickly, hurry the Blood, and detach the thinner Liquors out of the Stomach, Guts, and Blood, and drive it with them out at the Lungs, Pores, &c. and leave the Body hot, dry, and faint. If one drink strong, thin Drink, when the Stomach is empty, and some Time before one eat, it bears down the Juices, and may make the small Tubes, which compose the Sides of the Blood-vessels, secrete their Juices, cause the Piles, &c. When, in a little Time, one drinks a great Quantity of spirituous thin Fluid, even so much as to affect the

Heat, soon after drinking it, one feels a Sense of Chilness and Coldness in the outward Parts, the Pulse moves quickly but weakly, and one's Strength abates. Is the first Steam too volatile, and goes off too quick at the Lungs? or is it the Quantity of the Liquor that abates the natural Ferment of the Stomach and Guts, and makes undigested Fumes go off clogged with too great a Quantity of Humidity and Phlegm? Whether it is I am not certain; but after a while one becomes hot, the Steam goes off strongly, and in great Quantity, the Pulse moves quick and short, and in a short Time after, one becomes feverish, weak and faint. When all the Blood-vessels, are thus filled with too great a Quantity of Steam, it keeps the *Vena Cava*, great Artery, and Heart almost constantly full and stretched, and the Succession of the Steam is so strong and quick, that the *Vena Cava*, and great Artery, have not Time to relax and stretch, which gives the Heart the local Motion; nor the Heart to empty and fill, which gives it that additional Motion it has by Extension and Contraction, and makes the Pulse slower and stronger, so the Heart beats quick, but rises and falls little; the Pulse moves quick,

quick, but the Arteries rise and fall little, and little Blood succeeds at once ; and if the Steam were strong enough to keep the *Vena Cava*, and great Artery stretched, and the Valves of the Heart constantly open, the Blood would run smooth without moving the Heart or Arteries. Fevers may be occasioned by too much strong Drink, too violent Exercise, by outward Cold, cold heavy Meat, or any Thing which lets in too many Juices, raises the Ferment and Steam too high, and I think continued by a violent Rotation of sharp Juices from the Blood, into the Stomach and Guts, which keeps the Steam too hot and sharp, and successively forces back the Matter thence into the Blood. And, I think, what they call a Fever of the Spirits, is occasioned by Steam's being volatilized too much ; so that which is secreted into the Nerves, becomes too hot and subtile for its Employment ; and they are prevented, or stopped, by stopping the Glands in the Stomach and Guts, and preventing the Juices from issuing out of the Blood thither, or by absorbing, sheathing, or clogging the Juices, and Agents, in the Stomach and Guts, which are too sharp, and raise too much sharp Steam there. Brisk bottled Ale, or small Beer,

Beer, has some Effects upon some Stomachs different from any other Liquor, which People call Windiness, it makes the Stomach feel full, sometimes goes so far, as to make one like to faint, and makes the outward Parts sometimes hot, and sometimes cold and clammy, the Pulse move weakly, &c. Whether there be any real Air in it, sufficient when expanded by Heat, to extend the Stomach and Guts, and not go off as Steam does, or whether there be something in them, which irritates the Stomach, makes too great an Emission of Juices into it, and raises too much Steam, I cannot tell; but discharging Wind upward or downward, gives Relief. Cold Water drank, or cool Air breathed, helps violent Action, and supports us under it; and a moderate Quantity of good strong Wine at Night, rectifies the Stomach; though, as I said of violent Exercise, a Man may manage his Body by Degrees, and accustom it to discharge great Quantities of strong Drink, yet if one, who has not accustomed himself to drink strong Drink, at any Time drink a very great Quantity, it will have much the same Effects as violent Exercise would have upon him; both being occasioned by the too great
Emission

Emission of Steam from the Stomach and Guts, only the Lungs, Pores, Neervs, &c. do not discharge the Steam so much as in Action, which makes it affect the Head and Senses, more than Action. If one use violent Action, when the Stomach and Guts are full of strong Drink, it will vastly augment the Effects, or if one go to Bed, then the Cover reflects the Heat, opens the Pores too much, makes one sweat too much, and weakens the Parts. The most sudden Inconveniencies happen, by drinking much cold weak Fluids, and condensing the Steam suddenly, when the Body is very hot with Action, the Steam high, and the Juices thinned, melted, and rendered liable to pass in great Quantities, into the Stomach and Guts; and by drinking much spirituous Liquor, when the Body is very cold, the Blood and Juices thickened, so that the Steam cannot get Vent as fast as it rises. To enter into a Detail of the Qualities of the various sorts of Meats, as Bread, Flesh, Fish, Fruit, Herbs or the several Kinds dressed, cooked, seasoned after different Manners, and mixed with various sorts of Sauces, &c. the various sorts of Liquor, as Beer, Water, Wine, Spirits, with various Qualities, as old, new, sweet, sharp, bitter,

bitter, small, strong, &c. and the several Mixtures and Compounds added to them; and the various Mixtures we make of them each Meal, would be too large to be inserted here, I shall only consider the Quantity. If you eat less than your Stomach can digest, and than will supply the Body with Nourishment, you will be light and weak, and sooner hungry. And if you eat and drink not enough to raise sufficient Steam, you will always be costive or stopped, because the outward Pressure of the Air will force the Blood and Juices, into the Vessels and Glands, which compose the sides of the Stomach and Guts, and Valves in them; straighten and contract the Stomach and Guts, make the Valves swelled and strong, and hinder the Excrements from discharging. If you eat more than the Agents in the Stomach, can digest and distribute, Part of it will go off crass into the Guts, and Part remain in the Stomach undigested, in Form of Phlegm, imbibe and entangle the Salts, &c. and become sour, or bitter, or putrid, and in such Condition be successively transmitted into all the Parts of the Body; and if this be done leisurely, it will by Degrees overset the Operations of it; but if, while the Juices are fit,

fat, and in sufficient Quantity, the Matter undigested will abate the Steam, so as to let a greater Quantity of Juices flow in; or this four or offensive Matter will irritate, and open the Glands in the Valves of the Neck of the Stomach, or in the lower Guts, and make Efforts to discharge it, upward or downward. If it be true, that Cantharides, or any such hot piercing Thing, taken into the Stomach can invigorate People for a Time to such a Degree, as is reported, it must be by opening the Glands into the Stomach, letting in the Juices, and raising a brisk Steam; and, perhaps, by also opening the small Glands in the sides of the Blood-vessels, letting out the fine Juices, and thereby both thinning the Blood, and opening and extending the Blood-vessels, Passages, &c. For 'tis certain, no vigorous Action can be effectually performed, unless the Steam thin the Blood, and prevail against the outward Pressure of the Air. And the Steam prevails most in People who are not very fat, and have their inward Passages most open. Milk, I think, contains Corpuscles of all the several sorts of Matter, put into the Stomach, as fibrous, vegetable Matter, Oil, Salts, Spirits, &c. in a thin Fluid,

Concern-
ing Milk
as Food

Fluid, nearly resembling Water, separated by an infinite Number of Ducts, and Glands in the Udder, of different Sizes and Capacities, for the Corpuscles of different Magnitudes and Figures in it: While it is new, 'tis near equally mixed, but when it has stood a while and cools, it separates, and the Oil or Cream swims at the Top. If the Season be very hot, the Corpuscles of Fire agitate the acid Corpuscles in it, makes them divide the Corpuscles of the several Kinds, one from another, and lets the gross phlegmy Matter precipitate. A small Quantity of the Juices, drained out of the Sides of the Stomach of a young Calf, commonly called Rhennet, mixed in a great Quantity of Milk, kept moderately warm, will cause a gentle Separation, leave the Whey thick and soft, and the Curd soft and tender; a greater Proportion of Rhennet, and a greater Degree of Heat, will cause greater Separation, leave the Whey thin and sharp, and the Curd hard and tough: And it will have different Effects upon the Body, according to the Quantity and Quality of Juices, &c. it meets with in the Stomach. In young Children, &c. where the Juices are not too many, nor too sharp, the Separation is very gentle, the

the Steam carries off a due Mixture, and the excrementitious Part is soft and tender. In aged People, where the Juices are in great Quantity, fitted to dissolve stronger Food, or where they are in too great Quantity, or too sharp, they cause a strong Separation, make the Whey thin and sharp, and the Curd hard and tough. And the Whey, with those Juices in it, sometimes goes down, opens the Valves and purges, * sometimes goes off in sharp Steam into the Blood. The Curd, stays hard and tough, upon the Stomach, and afterwards clogs the Juices, makes the Steam go off phlegmy, loads the Blood, fouls the Passages, lessens the Discharge by Urine, &c. and the Remainder goes off in phlegmy, tough Excrements. When by drinking Milk, soft Drink, &c. the Steam is too crass, the Stomach and Guts will be distended, the Appetite lost, the Body heavy, the Sweat hang upon one's Skin, and wet one's Linen. But upon drinking dry, old Wine, or ripe Beer, the Steam will rarify, the Stomach and Guts settle, the Appetite return, the Body become light, and there will be little Appearance of Sweat. Cheese, which has not much
Salt

* *Sydenham* upon the Use of Whey in Dysenteries and Rheumatism.

Salt in it, clogs, and prevents the sudden Hurry of the Steam, prevents Surfeits, Vomitings, &c. occasioned by too great an Irruption of Juices, and composes the Agents, and does just the Reverse of what is attributed to it, does not help, but hinder the Agents in Digestion. Cheese, that has Abundance of Salts in it, has the same Effect as Cheese, but the Salts in it have the quite contrary Effect, for all sorts of the sharp Salts forward Digestion: but chiefly Sea Salt, which is mixed with the Cheese, and that either joined or separate, prevents sudden Hurries of the volatile Salts, of which more hereafter. 'Tis pretty evident that Alteration of Diet, will in Time make the Juices of the Stomach blunter or sharper, and the Steam stronger or weaker. Alterations either Way, should be made very slowly; for that which is hard to digest, will not be digested by few or blunt Juices, and that which is easy to digest, will be too much digested, or made too sharp, by too many, or too sharp Juices; and that which is thrown out by a strong Steam, will be too heavy to be circulated by a weak Steam; and that which is thrown out by a weak Steam, will be hurried too fast by a strong one. Whe-

Of
Changes of
Diet. It
should be
made gra-
dually, and
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ther

ther there be not frequent Errors in prescribed Diets, especially on the weak Side, deserves to be considered.

CHAP. XV.

Some Thoughts about the Causes of Sleep, and what is done during Sleep.

IN Order to know what occasions an Inclination to Sleep, and what is performed in Sleep, 'tis necessary to consider the Circumstances we are in when we feel that Inclination; when we have slept a while, and when we have no farther Inclination. One has almost constantly an Inclination to sleep, as soon as one has eaten and drunk too much, for then the Juices, Corpuscles of Heat, Salts, &c. will for a little Time be entangled, and sheathed in the Meat, or be divided and overpowered, so that little Steam will go off, and one becomes dull, heavy, &c. When there is a great Quantity of cold Phlegm lodged in one's Stomach, Guts, &c. which hinders the Agents from sending out sufficient Steam, to circulate the Blood, &c. When long, or violent, Action has wasted the Steam, and left not sufficient to circulate the Blood, ex-

The Times when one is generally inclined to Sleep.

Animal
Process.

tend the Parts, &c. When one has sat, or laid still a good while, without Action of Body or Mind, so that the Fermentation is not assisted by Motion or Action, and the Steam moves weakly : When one has been inactive a good while in a hot Place, that the Pores are open, and the Steam perspires too much, or too much of the finer, thinner Steam : When one has sat long in a crowd of People in a close Place, so that the Air which goes into the Lungs is full of Heat and Steam, does not discharge a due Share of the Steam out of the Lungs, especially of the Heat, and that opens the outward Pores, and perspires too much there. Some People have a great Inclination to sleep when they are almost drunk ; whether the Liquor oversets the Ferment in their Stomachs, or the Steam is emitted faster than it can be discharged, and hinders Circulation, &c, or more, or crasser is sent into the Head, than is necessary for the Nerves, I cannot determine. We need most Sleep in cloudy, foggy Weather; and some Creatures sleep all the Winter, till the Heat raise Steam in them to thin their Blood, &c. We ought also to consider all the Contraries which prevent Sleepiness, as eating and drinking sparingly, a clear Stomach,

Stomach, and a brisk Ferment, a moderate Quantity of spirituous Liquor, moderate Action, or any other Cause which moves or excites a sufficient Steam from the Stomach or Guts to circulate the Blood, or which shuts the Pores when they are too much opened by Heat without, or Action, so that the Steam perspires as fast as it rises, and prevents its farther Waste, and keeps in the succeeding Steam, to restore our Strength and Vigour, as cool Air, a strong Pressure of the Atmosphere, &c. Whether the Air has the same Effects upon the Pores, or Bladders in the Lungs, as it has upon those in the outward Skin, whether cool Air condense the Steam there, and straighten the Pores, or whether it bear off more Steam than hot Air does, I am not certain. One cannot sleep, or Sleep does one little good unless one be kept moderately warm, and unless there be something in the Stomach or Guts lately digested, to prevent any Uneasiness by the Cold without, or by the gnawing of the Juices within. When the Steam goes off too sharp, or too little entangled, or with too small Burthens, and frets or heats the Parts too much, or when too much of it goes and hurries the Blood too fast, it

What hinders that Inclination.

What absolutely prevents Sleep.

puts one into a Fever, and hinders one from sleeping; and when one sleeps, either the Fever abates by Sleep, or the Fever is begun to abate before one sleeps; so it seems that too little Steam, or gross inactive Steam, causes Sleep; and too much or too strong, or too active Steam hinders us from sleeping. When one sleeps, the Juices have Time to secrete into the Stomach, the Agents have more Time to act, or repeat their Actions, in the Stomach and Guts, because there is no Action to force off the Steam, and a little serves to circulate the Blood, because it moves very slowly, because the Lungs move, and respire very slowly, and because the little Steam, which perspires at the Pores by being defended from the Motion of the Air, is not condensed, or dispersed, but rebounds and keeps the Body warm, and the Fluids thin; and 'tis very likely, that in the regular slow Motion of the Blood during Sleep, the Corpuscles adhere, to supply those born away from the Parts in Action, and that several Secretions may be made to supply the Vessels, and especially the Nerves, with each their proper Juices, Steam, &c. for the several Uses to which they are employed. When every Thing is in fresh Motion,
the

the Stomach warm and light, the Parts <sup>The natu-
ral Time
of waking.</sup> replenished with Steam and plump, the Blood thinned, and in Motion, the Nerves stock'd with Steam, and the Body fit for Action, we awake. The Steam aug- <sup>The In-
conveni-
ence of
lying after
that Time,</sup> ments gradually, from the Time we be- gin to sleep, till it come to a due Height, when we naturally awake; and if we lie much longer in the common Degree of Cover without Motion, the Heat encreases, the Steams are rarified too much, or the Pores opened too much, or both; and though the Blood do not circulate very fast nor strongly, abundance of the Steam perspires, as one may plainly see, by holding one's Hand out between one's Eyes and the Light; and if one lie long, one will be as lank and as faint as when one first laid down: and lying down, will never recover one, till one have fresh Sup- <sup>The Steam
weaker
when one
falls asleep
than when
awake.</sup> plies of Food to raise Steam, or till one rise, or use Action; I think when the Steam is weak, and one falls asleep, at first when one begins to sleep, the Steam for some Time is weaker than when one was awake: For if one fall asleep in a Chair, and sleep for half an Hour, one's Face and upper Parts will be much paler, than if one had sat still as long in the same Posture awake. And as the Steam

The Con-
sequence
of it.

is weak at Night, when one goes to sleep, 'tis no wonder that a great Quantity of Meat, or Meat hard to digest, lies heavy upon the Stomach for some time, and does not digest, and go off, till the Steam by sleeping, rise to a sufficient Force. If

The Mor-
ning Ap-
petite dif-
ferent by
protract-
ing Sleep.

one rise in the Morning when Sleep has done its Office, and the Stomach be contracted, any sort of solid Meat will be acceptable to the Stomach. If one lie too long, till too much of the Fluids be born off in Steam, and the Steam be too much weakened, or the Stomach be distended, thin warm Meat will be more agreeable. Besides the Advantages afore-
said, there is some considerable Difference

The Ad-
vantages
of Sleep.

between being asleep, and resting awake; whether when one is awake, the Steam be not refined, and thinned so much, or the lacteal Vessels are not expanded, and relaxed so much, or the outward Pores are not so open, or there is a greater Quantity of Juices, or Juices more gross, issued into the Stomach and Guts. If one sit, or rest long, the Stomach and Guts fill and extend with gross Steam; which, if the Excrements, at the several Valves, be not too thin when one begins to use Action, will be discharged backward. If it cannot be so discharged, Action will
rarify

rarify or force it off. But one seldom find's one's Stomach or Guts distended out of course, when one has slept sufficiently. 'Tis said, the Eastern People use the best Opium, and that it makes them brisk, strong, and fierce, and that which we use, is but the coarser Part, and Dross of the Opium, and so makes us sleep; but that cannot be always true. Suppose the Effect of Opium to open the Glands in the Stomach, does the fine Opium let in finer Juices, or more leisurely, and the coarse Opium the coarser Juices, or too fast, and raise too gross a Steam? Or do we err in Quantity, or does it let in too many Juices into the Stomachs of those who use it seldom, raise too gross a Steam, and confound their Senses, till Sleep has thinned and carried it off? Or does it open the Glands in the Brain, which secretes the Steam for the Nerves; the finer a little, and the coarser too much, and work its Effects there. Although 'tis likely, it will have like Effects upon the Glands, wherever it passes, it seems to me, that it has its principal Effect in the * Stomach, because it makes many People vomit considerably in a very short Time.

N 4

C H A P.

* Dr. Mead in his Treatise upon Poison, relates an Experiment upon a Dog, where what Effect it has in too large

C H A P. XVI.

The Effects of too much Cold.

1st. It
condenses
the Steam
and repels
it.

WHEN for want of Action, or Strength of the Steam within, the Cold prevails too much upon the outward Parts, it condenses the Steam there, and thickens the Blood, shuts the Pores, and contracts the small Vessels, and thereby the Blood is obstructed, so that it cannot pass in due Proportion, for Circulation and Secretion. And in Proportion to the Quantity and Degree, 'tis so coagulated, it becomes more or less difficult

large a Dose upon the Stomach, is exactly described, and which, according to Mr. *Hutchinson's* Theory, very easily explains the Operation of this Drug, whether used as a Medicine, or given in Quantity sufficient to prove deleterious, and become a Poison. I beg Leave here to desire the Reader to peruse this Chapter of the Doctor's accurately, and then impartially to decide whether his Account of Sleep, or Mr. *Hutchinson's* seems more rational, and which more becoming a Treatise, whose Title imports a Mechanical Account of the Things it treats of. Vid. *Edinb. Med. Essays*, Vol. 5. Dr. *Alston's* Essay on Opium, and his Exp. on Frogs and other Animals therewith: There you will see how this Drug operates plainly, viz. by its Effects upon the Steam; the Motion of the Blood is render'd slower and slower till the Animal dies. The Dr. has some very odd Expressions as to the Variation of the Pulse, but this concerns not us, we want only his Experiment.

Cult for the Steam to thin it, as it returns into the larger Vessels within. But as the Steam is hindered from perspiring, it encreases its Force within, and makes a greater Effort to circulate and throw off the coagulated Blood. At first it causes Stoppages, or Obstructions in the Head, Lungs, &c. and passes with great Difficulty through the Vessels, in the Parts which have been bruised, strained, or broken, and causes Pain there. If the Steam be able to thin Part, and throw off the rest at the Nose, by coughing at the Lungs, by Sweat, turbid Urine, or into the Guts, and thence by Looseness, little Damage ensues: If not, the Effort is continually heightened, till it terminate in a Rheumatism, or Inflammation upon some Part, or in a Fever. The Pores of the Feet being much opened by Heat in walking, the Steam issuing, rarifies the Air between the Soles of the Shoes and the Feet, and Water passes in form of Steam through the Soles, and mixed with Heat, enters the open Pores, and circulates in the Blood, coagulates its Corpuscles, causes Stops in the straight Vessels, in the Head, &c. as aforesaid. And Wet thus conveyed to any Part of the Body, as by damp Sheets, &c. enters more, and does

The Effects from these.

Cold from Wet by the Feet.

The general Effects
of Cold.

Inconvenience of
the Belly
being too
cold.

does more Hurt than if the Part were kept immersed in cold Water. When the Corpuscles of Blood, or Juices are storkened, or united, or made crasser by Cold in any Part, Wet on the Feet, &c. those Masses, as they are circulated, stop in the straightest Passages, and cause Obstructions there, and the Juices so coagulated, and these they stop in the straight Passages, are wanted in the Places whither these Passages lead. For if A and B unite together, they cannot pass where either of them would have passed alone, nor supply their different Offices where they can pass. Suffering the Belly to cool too much, makes the Steam there condense, and the Juices press in, and cause the Colic, or affect the Guts, according to their Qualities, cause Looseness, &c. and perhaps, condensing the Steam too much by Cold in any Part of the Body, makes some Secretions of Juices into that Part, which may contribute towards causing Pains and Rheumatisms, as well as the Stagnation of the Juices. And Cold may have the same Effects upon the Steam in the Nerves, though that be not so easily perceived. When any of the inward Glands are straightned by Swellings, Stoppages, &c. they secrete sharper Juices than usual, and

and have different Effects upon the different Parts: These secreted into the Lungs and Throat, tickle the Parts, cause Coughing, &c. How these Efforts in the Lungs we call Coughing, are performed, whether by Phlegm, or something which swells the Glands, stopping the Steam till it break out with greater Force, or whether when any such sharp Juices tickle or offend the Lungs, or Neck of the Wind-pipe, it occasions those Convulsions, and how that can be involuntarily performed by the Assistance of the Muscles, or whether the Neck of the Wind-pipe be so contrived, that when any Thing offends, it shut without Direction of the Will, as our Eye-lids do, and the Force of the Steam and Air breaks out in Jerks, deserves to be considered. And perhaps, ^{A Con-} the Cold in the Northern Countries may ^{jecture} shut the Pores of the outward Skin, or ^{about the} straighten them so much, till they retain the Salts and sharp Juices in the Vessels and Glands, which should be perspired there, and cause the Itch. When there ^{What re-} is any thing in the Blood, to be thinned ^{quired up-} or driven off, the Steam should not be ^{on the first} abated too much. When the Steam with- ^{Effects of} in is almost wholly condensed with Cold, Warm Fluids or Spirits which will pass the

Agues the
Effects of
cool, moist
Air.

Conjecture
upon their
being pe-
riodical.

the *Pilorus*, if it be open, or rise soonest into Steam and pass, refreshes one soonest. Or if Cold have condensed the Steam, and let in the Juices, warm Fluids which will pass soonest into the Guts, and dilute or soften the Juices, give Ease soonest. When the Air is charged with cold, humid Matter, it bears not off enough of that sort of Matter from the Lungs; and perhaps, also leaves some of the Matter it carries there, and condenses and clogs the Steam, and if it be discharged among the Juices into the Stomach, may cause Agues, &c. and when it has cooled and contracted the Stomach too much, the brinous Juices (which I suppose come last) will discharge in too great Quantity into the Stomach, raise the cold Matter there into Steam, and cause hot Fits, and the different Degrees of Heat and Cold between Day and Night, may make them periodical.

C H A P. XVII.

The Effects of too much Heat.

1st, Rare-
faction of
the Blood,
and Ex-
pansion of
the Vessels,

Outward Heat thins and expands the Blood and Juices, in the Vessels and Pores; and expands and opens the Vessels

Vessels and Pores, and gives free Passage for the Steams outward. Outward Cold condenses the Steam, thickens the Blood and Juices, in the Vessels and Pores, contracts the Vessels, shuts the Pores, and hinders the Passages of the Steam outward. And the greatest Danger seems to be ^{Danger of} when the Seasons change very suddenly, ^{sudden} when the Steam is heightened, before ^{Heat.} the Passages and Pores be opened, the Blood thinned, and prepared by Degrees; or when the Season becomes suddenly ^{Or Cold.} cold, whilst the Passages and Pores are open, the Blood thin, and the Steam high. When any one removes suddenly ^{Change of} into a hotter Climate, and where the Pressure of the Air is greater, it lets go the finest Juices at the Pores, and presses too great a Quantity of the sharp Juices into the Stomach and Guts, and causes Fevers or Fluxes. When the Air is ^{Too hot} charged with too much Heat, volatile ^{Air the} Salts, &c. it will not take away a due ^{Occasion} Proportion of such Matter from the Lungs, ^{of conta-} and perhaps leaves some there, which being secreted with the Juices into the Stomach, cause hot Fevers, &c. And when the Salts are extremely sharpened by ^{gious Dif-} Rementation, infectious Diseases, &c. ^{orders.} Air ^{The Re-} charged with the contrary sorts of Mat- ^{medias} ter, ^{proposed.}

A com-
mon Ex-
periment
and Con-
jecture
upon it.

ter, or pure, or in Motion by Wind, if the Disorder be not gone too far, prevent, however abate it. And 'tis likely Food not too fluid or thin, which has had the Spirits and Salts extracted out of it, might stop a Fever, by clogging the Juices, and discharging them downward. I have seen about a Quart of Man's Excrements, which had been some Days discharged, thinned with as much Ale, poured into a Horse stark mad, in that violent Distemper they call the Staggers, of which they commonly die in a few Hours, and the Distemper abated, and the Horse recovered; whether the Cause proceeded from too violent a Ferment in the Stomach, which that abated, deserves to be considered,

C H A P. XIX.

The Effects the Matter in the Air, and the different Gravity of the Air, have upon Animals during the Time that Rain rises.

The Con-
dition of
the Body
while the
Rain is
rising.

WHEN Rain is rising, the Pressure of the Atmosphere is lessened, and Abundance of Corpuscles of Heat, and Moisture,

Moisture, &c. are mixed in the Air, the Course of Things in our Bodies are varied. All the outward Parts being less compressed, and the inward Force exceeding that without, the Stomach, is suffered to extend, by the Force of the Steam, and the Guts to receive, and contain a greater Quantity of Excrements, most of the Blood will be in the outward Parts, and not be pressed back or inward, so much as 'tis forced outward, and all the Vessels and Glands in the outward Parts will extend, and contain a greater Quantity of Juices, as lacing Stays very hard, or compressing the vessels in any considerable Parts, will contract or flatten the Vessels in those Parts, make the Blood and Juices fly into the other Parts, and make the Vessels extended, and the Parts plump. And the air cannot con-
 dense nor bear off the like Quantity of The Alter-
 ration of
 the Air
 then and
 its Effects. Heat, and Moisture at the Lungs, as it did when cool and pure; for whatever the Air is saturated with, as Corpuscles of Heat, Moisture, &c. they fill up the Interstices of the Air, which admit these sort of Corpuscles, and leave no room to admit and bear off Corpuscles of the same Sort from the Lungs, and perhaps rather leave some of those it carried there. And if any sort of Matter be not discharged in sufficient Quantity,

Quantity, it must abound too much in the Blood, and affect the Body according to its Quantity and Quality, and in this Case, the Matter not discharged and remaining extends the outward Parts farther, the lower Parts most, makes the Feet sweat, &c. and expands the Blood and Juices, and only the finer thinner Matter goes off at the Pores, and not proper Matter, nor in due Quantity. When all the Vessels in the outward Parts are extended they will one compress another, and the Body will be heavy and dull, and if there be any Parts that have been broken or bruised, or that are weaker than the rest, they will be extended, and compressed, more than the rest, and cause Pain, and the Vessels and Glands thus extended for any considerable Time lose their contractive Force, which was performed by pressing the Juices into the smaller Vessels in the Sides of them. And the Compressure of the Air being also lessened, the Blood makes not Secretions of Juices necessary for the several Uses: They will not be pressed in due Quantity into the Stomach, and the Meat will not be duly digested, nor into the Guts to discharge the Excrements downward, and when a Stop happens there, by this or any other Cause, the Meat is kept too long

long fermenting upon the Stomach, and in the Guts, till it be divided so small that the greatest Part is forced through the lacteal Vessels into the Blood, and the Salts, &c. freed too much, and made too sharp for the Juices, and the Remainder, which settles downward, is only tough Phlegm, which it could not dissolve, nor the Guts scarce discharge. If this Case continue not too long, so that the Body endure it without farther Inconveniency, when the Rain falls and clears the Air, and the due Pressure and Coolness of the Air returns, the Coolness and Purity of the Air condenses, and discharges a due Share of the Steam out of the Lungs, storks the Juices in the outward Pores, and jointly with the Increase of the Pressure shuts the Pores, repels the Steam, and encreases its Force inward, makes the Glands discharge into the Stomach and Guts, digest the Meat, and discharge the Excrements, and Things take their former Course. If there were a great Quantity of sharp Humours pressed out of the Blood, into the Stomach and Guts, or freed by Fermentation there, before the Rain begins to rise, when it begins to rise, and the Pressure of the Air is lessened, they will be driven out in great Quantity by Steam into the

What happens upon the change of this Weather.

O

Blood

VOL. X.

Sick
People sen-
sible of
the least
Alteration
of Wea-
ther.

Blood, and make the Body hot and uneasy, and upon the Return of the due Pressure of the Air, will be pressed suddenly into the Stomach and Guts, make a Hurry, or cause Disorders there, according to their Quantity, Quality, or other Circumstances. And generally a while after a healthy Person rises out of Bed, and comes under a greater Pressure of the Air, the Juices will be pressed inward, and he will have an Inclination or Motion too a Stool. Sick People are more sensibly affected by the different Pressures of the Air, Degrees of Heat and Cold, &c. Nay even by rising or going to Bed. Difference in Clothing, girding it close about the Middle, or leaving it loose, &c, according to the various Causes which affect them, and by the periodical Alterations of the Gravity of the Atmosphere, by the Course of the Moon, &c. several Diseases have more or less Effect; and several Secretions and Discharges are made regularly, except some other Circumstances intervene, and the Degrees of Heat between Summer and Winter, Day, and Night, &c. each change and renew the Operations in our Bodies. * Experiments

* See *Hoffman* Medicin. Rational, Tom. I. p. 87. Sect. 4. & seq. Edit, 4to. 1729. These shew that the Experiments made, answer the Effects here supposed.

riments should be made, whether one be not much heavier when the Air presses least, and the outward Parts admit more, and the Guts discharge less, than one is, when the Air is strong, and the Discharges regular, and whether one is not stronger and weaker, in Proportion to the Strength, or Weakness, of the Pressure of the Atmosphere.

CHAP. XX.

The Effects, the Matter in a Wind which comes over a vast Tract of Land, has during the Time it blows.

A DRY, easterly Wind, brings along with it, from the Continent into ^{Of our East Winds} this Island, Corpuscles of Cold, and of some mineral or terrestrial Matter, heavier, or less active, than those which other Winds bring from the Sea, and they thicken the Juices in the outward Pores, and hinder the Steam and Matter it bears with it from perspiring, and 'tis likely do much the same things in the Lungs. Whether it be by the sudden Changes, or that the Corpuscles it brings, be more inactive than those of Cold,

Its Effects
upon our
Bodies.

they affect or dispirit our Bodies, more than a great Degree of Cold does, when the Wind comes from another Quarter : Whether 'tis by hindering a due Discharge out of the Blood at the Pores and Lungs, or whether the Air, being saturated, is not able to admit and bear off what is discharged at the Lungs, or whether it insinuate its Corpuscles into the Blood at the Lungs, and leave them there, or all these Ways, I am not certain. But the Pulse is disordered, and 'tis likely the Juices are rendered thicker, or less able to secrete, or less active when secreted, and the Steam does not rise in sufficient Quantity, or is too gross to pass, or is obstructed by the Thickness of the Blood and Juices; and being so pent up in the Guts, and inward Parts, extends them, causes a croaking Noise in the Guts, hinders due Digestion, and regular Discharges. And though the Physicians order their Patients to keep within Doors warm, when an East Wind blows, I think those who can endure Exercise, need it more than at any other Time; and brisker Liquors than they are accustomed to. In this Case, as in others, when the Blood is thickned too much, or when regular Discharges of the Steam and Excrements are not

not made, the Vessels will extend, and cause Pain, where they have been strained, bruised or broken, or where they are weakest, in Proportion to the Quantity of Matter in the Air, the Time it continues, &c. when any considerable Quantity of Rain falls, during the Time this Wind blows, it abates the Effects for some Time. If this Wind continue for any considerable Time, till it has thickned the Blood so much, that the Juices cannot pass into the Vessels in the Sides of the Guts, to shut the Valves freely, the Steam will pass out of one Division of the Guts into another, irregularly, both down and up, and encreases the said croaking Noise in the Guts, and will hinder the several Parts from contracting in their Turns, and consequently the Juices from issuing into the Sides of the Stomach and Guts, for Digestion, Discharge, &c.

C H A P. XXI.

The Causes of different Constitutions.

Difference
of the
Constitu-
tion de-
pends upon
the differ-
ent For-
mation of
the Orga-
nical Parts.

THE Word Constitution is very common in every one's Mouth, what they mean by it, is difficult to guess. I think the Difference of the Operations in different Bodies, must proceed from the different Sizes of the several Tubes and Glands, from the Strength or Thickness of their Sides or Valves, and the different Quantities of the Flesh, and the Thickness of the Skin, or the Difference in Solidness or Laxness of the Flesh, or Skin, which enwraps and covers them. 'Tis true, the Fluids are a great Part of the constituent Parts of the Body; but supposing two Bodies, whose Tubes or Valves differ in Capacity, in any one or more Parts, and whose Flesh differ in Quantity, and Skin in Thickness or Degree of Solidness, fed with the same Diet, using the same Exercise, and every Thing exactly, the Fluids will differ, and contain more of this, or that sort of Matter, &c. and consequently the Operations differ. If the Ducts and Glands into the Stomach and Guts be wider, and secrete more

more of that sort of Liquor, in one than another, the Operations there will be stronger, and there will remain less of that Matter in the Blood, so of Gall, or any other of the Juices. A Man that has a great Quantity of Flesh, or is fat, cannot perspire the Steam in such Quantity at the Pores, but the greater Quantity will go at the Lungs, and in violent Exercise choak him. A Man that is lean, or has little Flesh to cover the Arteries, Veins, &c. will be weak, because the Steam will perspire at the Pores too fast. A Man whose Ducts or Glands for secreting the Juices, to open the Valves, and discharge the Excrements, are too straight, will often be costive, and those, who have them too open, will often be too loose. The Constitution no doubt, is formed in the Womb, by the different Juices of the Parents, by the Food of the Mother, and various Accidents, and may be, in a great Measure, changed afterwards by various sorts of Food, and by divers other Means. A Person that has been bred, or accustomed, to eat cold Fruits, and such Things as give Opportunity to the Juices to issue plentifully into the Stomach, and afterwards eats and drinks hot Food, and strong Liquor, will straighten the Ducts.

Constitution
on form'd
in the
Womb,
chang'd
afterwards
by various
Accidents

and Glands into his Stomach, and alter the Composition of his Blood. In Northern Countries, where the Corpuscles of the Vegetables, as Oats, &c. are light and hot, where the Heat is not sufficient to raise Fruit, whose Corpuscles are cool and heavy, these People's Blood abounds with Corpuscles which occasions the Scurvy. Those who feed on too cold Fruit, or Diet, will make too great a Discharge, or Waste of the Juices into the Stomach, and occasion something like the Rot in Sheep, which feed upon the cold Grass. A thousand Instances might be produced whereby the Constitution is altered; and the Skill of the Physician consists chiefly in knowing what Ducts or Glands let go or retain too much; or too large, or too small Corpuscles, and how to widen or straighten, open or shut them. Weak, cold Food causes a great Supply of Juices to issue out of the Blood, into the Stomach, and requires Action to free more to supply the Blood. Liquor, and Food moderately strong, need fewer Juices to raise them into Steam, and suffer fewer Juices to issue out of the Blood: And if there be equal Action, consequently the Blood will be stocked with a greater Quantity of those Juices; and Errors may be

be committed either Way. If the Juices intended for Diffolution of the Food, for Discharges, &c. be hindered from issuing into the Stomach by Astringents, such as red Wine, &c. they may affect the Parts, make the Blood too sharp, &c. If from issuing into the lower Guts or *Rectum*, they may make the Vessels swell, and cause the Piles: And any Part may be affected by Salts, or any other Thing, not from the Abundance of that sort in the Food, but from the Ducts, or Vessels which retain too much of them, or deprived of their Uses, by letting them go too fast. And the same Dose, of any sort of Physick, has different Effects upon Bodies, which have the Glands into their Stomachs or Guts of different Wideness, or which have different Qualities of this or that Matter, or of Matter of different Sorts in their Stomachs or Guts, or in the Glands or Blood-vessels, ready to be secreted into them, when irritated by the Physick, nay even upon the same Body, as those Circumstances vary.

In order to describe how Vomits, Purges, Clysters, Diuretics, &c. perform their several Operations, we must state the several Sorts, and Quantities of Matter there may be in the Stomach, Guts, Glands,

Glands, &c. the several Steps they make in their Operations, the several Degrees of their Operations, the several Positions they leave Matters in after their Operations, the several Effects the Matter discharged had, and the Matter remaining may have upon the Body.

CHAP. XXII.

The Use of Vomits, how they operate; the Damage they may do in some Cases.

The Intention of taking a Vomit.

THE Intention of taking a Vomit, is to discharge Phlegm lodged at the Bottom of the Stomach, on the Sides, or in the Glands, or brinous, or bitter, or four Juices from the Bottom of the Stomach, or out of the Glands, or out of the Blood through the Glands, when there is too great a Quantity, or when they are unfit for their Uses. The proper Time of taking it, is when the Stomach has ceased fermenting, discharged what it can, contracted, and the Glands in the Sides are filled, and the *Pylorus* shut, and the Ferment in the Guts is pretty strong.

The Time of taking.

Of what Nature an Emetic should be.

There should be such Corpuscles in a Vomit, as will open the Glands of the Stomach, till Juices secrete and raise a Steam, and such light sharp Corpuscles,

as

as that Steam can bear up, and with them, open the Glands in the Valves of the upper Neck of the Stomach, make them secrete, and thereby weaken, and open till the Steam get Vent, and open all the Neck upwards, and the Glands in the Valves of the Throat, and in the Mouth; so that upon drinking a Quantity of thin lukewarm Fluid, the Pressure of the Air against the Belly below, and of the Steam in the Guts, and into, and through the Blood-vessels, &c. in the Sides of the Stomach, and the Elasticity, or Expansion of the Steam in the Stomach, and Contraction of the Muscles of the Belly force the Steam, the four Juices, Oil, and tough Phlegm, which swims upon the Liquor, and the Liquor after it, out upwards, and so successively, as more Liquor is taken, more Juices or Phlegm secreted, or raised to the Top of the Fluid discharge them still thinner and thinner, till most of the Phlegm be discharged; and after that, if there be any solid Pieces of undigested Meat at the Bottom of the Stomach, discharge them with the Fluid, and cast off all bilious, bitter Juices in the Liquor, which, when once they begin to be stirred or secreted, ferment and fly like Gunpowder, and open the other Glands,

Reasons
for taking
a Vomit
in the
Morning.

Glands, during which it offends the Stomach, makes one desperate sick; but they force their Way, and are discharged in a short Time, and the Operation of the Vomit ceases. I cannot see how a few Grains of Matter put into the Stomach can perform this, and such-like Operations any another Way, but by opening the Glands, and letting in Juices. When there is a great Quantity of tough Phlegm in the Bottom of the Stomach, upon the Sides, or in the Glands, it entangles and blunts the Corpuscles in the Vomit, hinders them from opening the Mouths of the Glands, or when they are opened, tough Phlegm is difficult to force out of the Glands. Some think the Morning the most proper Time to take a Vomit, perhaps there may be less, or thinner Phlegm in the Stomach, and more Bile in the Glands. Besides in the Morning the Blood is thin, and the Juices in it more capable of being secreted, and the Steam is thin, brisk, and more capable of secreting them. If one take a Vomit, when there is a Ferment in the Stomach, and it is extended, and the *Pylorus* open, the expanded Force of the Steam within, resists or hinders, the Valves of the Glands in the Stomach or Neck of it, from opening,

ing, and secreting : And so the Glands in the upper Neck of the Stomach, continue expanded with Juice, and strong, and resist the Force of the Steam from issuing upward. Warm Liquor does not con-

dense the Steam, and if you drink cold Liquor, it will quite condense the Steam, hinder the light Corpuscles from being born up, to open the Neck of the Stomach, and will stop the Operation, or make it work downward. If you open the Valves

at the Neck, with a Feather, the Matter, Liquor, and Steam will break out with incredible Force. But as long as the *Pi-*

lorus is open, the Guts will supply the Stomach with more Steam, and keep it distended, and unless the Steam break upward in such Quantity, or be abated,

so that the Steam in the Blood can press the Blood and the Juices into the Vessels in the Sides of the Stomach, and contract it, and shut the *Pilorus*, the Valves of the Glands cannot open, nor secrete, nor the Stomach discharge any Quantity of the bilious, or sharp Juices, and the Discharge will be in Proportion to the Contraction. When the Stomach and Glands are cleansed, and naked, as soon as they are replenished with Juices, they would secrete greater Quantities. But perhaps,

The Use of warm Liquor in the Operation, and Effect of Cold, and Use of a Feather.

The Discharge differs in Quantity, and why.

in

in discharging the Juices out of the Blood into the Stomach, some Steam passes, and when a sufficient Quantity of Juices is secreted into the Stomach, they raise a Ferment, and stop the Valves of the Glands, and less Quantity of them is needed to raise the Steam, and dissolve the Meat, than when there was a great Quantity of Phlegm in the Stomach, too tough to be divided by them, or small enough to be born off by the Steam. And they will digest the Meat sooner and better, and the next Vomit or Purge will come at, and open the Glands sooner, and work more effectually. If any Vomit could be prepared to work effectually when the Stomach has been lately filled with cold, heavy Meat and Drink, even too full, and the Juices secreted into it before the Ferment were raised in any considerable Degree, I think there would be a greater Discharge of the Phlegm, Juices, &c. than at any other Time. The Phlegm discharged from one's Stomach will dissolve in simple Water, perhaps assisted with the Juices that come along with it. If one drink a good Quantity of Vinegar, or Lime-juice, would it dissolve the Phlegm in one's Stomach, or would it raise an Explosion or Ferment, and carry it down? If it did either, what Effect.

A Conjecture upon vomiting with a full Stomach.

Qu. As to Acids as preparatory to Emetics.

Effects would it have? If it did not carry it down, would a Vomit work soon after? A Stop in any Part of the upper Guts, makes the Steam reverberate into the Stomach, and upwards to the Top, and cause vomiting, or what we call an Inclination to vomit. When there is some light sour Matter upon the Stomach, which flies up, and opens the Glands in the Neck of it, that always makes us subject to belch. Some sorts of stale Beer raise a Steam, which makes the Glands in the Neck of the Stomach open, and Juices secrete, and makes some liable to belch, some to have that Pain in the Stomach which they call the Heart-burn, and perhaps different Things affect different Persons. When one rides hard with a full Stomach, soon after eating and drinking cold Drink, the Motion jirks the Fluids, and the secreted Juices, which perhaps swim at the Top, to the Neck of the Stomach, and open the Valves, and the Contraction of the Stomach, &c. makes one puke up the Fluid cold: for whilst the Fluid is cold, and the Steam condensed, one cannot rise, or belch what we call Wind. And when one has been loose, and the Glands in the Stomach open for several Days, the Juices, some Time after eating, do not make the Fluid

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The Case
of the
Duke of
Leeds.

so bitter, and sharp when puked, as they do at other Times, when one has been bound. It was supposed that the late Duke of *Leeds*, by eating much cold Fruit, or drinking much cold Liquor when hot, contracted his Stomach so, that it threw out any Food, or Drink, almost as soon as he had taken it. Perhaps the Glands all over, or those in the Neck of his Stomach, were vastly extended and weakened, or perhaps some of them burst, so that when he took any thing that raised Steam, and bore up any Corpuscles, which opened the Gland, the Juices in the Valves discharged too much, and that opened the Passage and the Steam, &c. threw out the Contents, which it seems the Steam which rose from a little cool Water, did not. If there were no Steam above the Food to expand the Stomach, it would contract, and press the Liquor both against the Valves of the *Pilorus*, and upward continually to the Valves in the Throat, and the Juices swimming would open them, and make us always liable to belch and vomit; and if the Guts were not so expanded with Steam, they would contract, and press the Liquor upon the Valves downward and upward.

The Use
of the
Steam
above the
Food in
the Sto-
mach.

C H A P.

C H A P. XXIII.

The Use of Purges, how they operate, &c.

THE Intention of taking a Purge, is ^{The In-} to discharge the Excrements and ^{tention of} Phlegm out of the Guts, Stomach, or ^{taking a} their Glands; and the sharp, sour, or bilious Matter out of any, or all of them, or which can be secreted through the Glands, out of the Blood into the Stomach or Guts, or when there is too great a Quantity of these Humours in the Blood; or discharged into the Stomach and Guts, or when they fall upon a Part, or when they do not discharge, or when the Juices perform not their several Offices. ^{The pro-} The proper Time of taking it, is when the ^{per Time.} Stomach has ceased fermenting, discharged all it can, the Glands filled, and the Stomach contracted, and the Steam in the Guts is mostly spent. The Corpuscles in a Purge should open the Glands in the lower Parts of the Stomach, and open the *Pilorus*; but should not be light enough, or liable to be born up by the Steam to the Neck of the Stomach. After the ^{Of what} Corpuscles in the Purge and Juices get ^{Nature a} ^{purging} ^{Medicine} ^{should be,} ^{and its O-} ^{peration.} Vent downward, they still open the Mouths

Warm Li-
quors ne-
cessary.

Mouths of other Glands in the Guts, &c. after the same Manner as the Juices, &c. which discharge the Excrements, described above, but more forcibly. And when the Valves are opened, the Guts widened, &c. the same Agents, viz. the Pressure of the Atmosphere without, and Force of the Steam within, raised in the Stomach and Guts, and the Juices and Steam issued out of their Glands into them, discharge the Contents from one Part to another, as described above, &c. at last force out the Excrements, till the Steam discharged with them, weaken the Force of that which remains within; and then the Steam in the Blood quickens its Motion into the Vessels of the Guts and Valves, and into the Glands of the Guts and Valves at the Fundament, Top of the Colon, &c. which contracts the Guts, and shuts the Valves, and so successively, as the Steam and Juices are secreted, and more Steam raised, the Valves are opened, and Excrements discharged till the Corpuscles of the Purge be intangled or discharged. A small Quantity of thin warm Fluid is necessary to be taken in the Intervals for the Corpuscles of the Purge to act in, and for the Juices to raise into Steam. The gross Excrements go first, then

then the thinner out of the upper Guts, with a Mixture of the Fluid drunk in the Intervals, and if it work effectually, next the sharp bilious Juices, which were in the Stomach or Guts, or secreted out of their Glands, mixed with the Liquor and Phlegm, sometimes the Phlegm first, and the Juices last. The Phlegm will sometimes make Stops, and the sharp Juices always fret the Guts, make one sick, and the Fundament sore. If the Purge be not strong enough, or work not effectually, either the Phlegm or Bile, or both, will stay, part in the Stomach, and part in the Guts, and the Phlegm will occasion Stoppages, &c. and the Bile, if it go not down by Looseness, cause colic Pains, Piles, &c. and if it go into the Blood, occasion Fevers, Rheumatisms, or &c. in Proportion to its Quantity and Quality. If the Corpuscles of the Purge, or too many sharp Juices wound the Guts, it causes that Pain we call Gripping, and it is likely the Colic is often occasioned by the latter. In a Purgé, where Fluids can pass quickly to them, they dilate or divide the Corpuscles of the Purge, or Juices, to greater Distances, weaken their Force, and remove the Offence. But in the Colic, when the Valves are shut

Inconven-
niencies in
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above,

above, or a Stop made, or the Parts filled, and no Discharge downward, the Fluids cannot presently come at the Part offended. If there be a great Quantity of tough Phlegm in the Stomach, it intangles the Corpuscles of the Purge, and prevents them from coming at the Glands, and hinders its Operation. If the Stomach be extended with a Ferment or Steam, or if there be little Phlegm, and a great Quantity of bilious Matter in the Glands, as soon as it begins to secrete, it flies, and makes a violent Ferment, and if the Steam be too strong, it will bear up the Corpuscles of the Purge to the Neck of the Stomach, and make one belch, and sometimes vomit, and stretch the Stomach and Guts, and shut the Valves before the Glands have Time to secrete, and the Valves of the Guts open: And by shutting the Mouths of the Glands, and extending the Stomach and Guts, whilst the small Vessels are full, compress the Nerves, cause Pain and Stitches, and drives Steam, composed of the Corpuscles of the Purge, Juices, &c. into the Blood, till it force its Way downward. If these Valves were not very strong, or if the Juices were forced into them, by a less Force than the Pressure of the Air, the Air without would

would press the Steam and Fluids within, out, both upward and downward, the Excrements rather downward, because of their Gravity, and because the Guts are wider that Way, and when the Glands in the Valves have secreted, lessened, and weakened the Valves, and suffered the Steam to make a Discharge. If upon the Abatement of the Force within, the outward Air and Steam in the Blood, did not in a Moment drive the Blood and Juices, into the Vessels and Glands, that compose the Valves, and by extending them shut the Valves, all the Excrements would be discharged at once; and if the remaining Steam within the Guts, did not in a Moment resist the Blood and Juices, they would extend the small Vessels in the Sides of the Guts to such a Degree, as would almost close the Guts. If the Juices did not secrete out of the Glands, and open the Valves, the Pressure of the Muscles of the Belly, or extending the Lungs, and pressing down the Stomach and Guts, or contracting the Muscles of the Stomach and Guts, (if they have any) would not further but hinder a Discharge. If the Excrements, Phlegm and Juices be effectually discharged, there will be little Supply of

Steam raised, and the outward Parts will be lank, for want of Supply of Steam to distend them; and the Pressure of the Air compresses the smaller Vessels, and forces a great Quantity of foul Matter lodged there by the Foulness of the Blood partly forced out of the Stomach and Guts by the Purge, and partly discharged out of the Glands, in the Blood-vessels, by the Corpuscles of the Purge, Bile, &c, born thither by the Steam to secrete into the larger Blood-vessels; and the Tension of the Steam in the Guts being weakned, allows the Kidneys to secrete grosser Fluids, and to discharge that foul Matter visible in the Urine. The Excrement, and that which raised the Steam, being discharged out of the Stomach and Guts, and the Force of the Steam being thereby abated within them, it gives an Opportunity to the Steam in the Blood, pressed by the outward Air, to force the Juices into the Vessels and Glands, which compose the Stomach, and Guts, and Valves, and to contract, and straighten them, and shut the Valves close, and by the Pressure of the Vessels and Glands filled with the Juices, to straighten the lacteal Vessels. But a Day or two after the Purge, when the Steam is raised, and the

the Passages open, the Steam goes off freelier, makes the Blood move quicker, makes the Body light, and the Complexion florid, and after the Glands are replenished with Juices and secrete, if they be sharp, they make one rather feverish, and any Quantity of spirituous Liquor or Exercise does the same more, than when the Glands and Passages, were not so open. The Stoppages, Phlegm makes in the Passages, permit only the thin Fluids to pass, and overstock the Body with Salts, which are intended by Nature to dissolve and carry off the Phlegm, and when we take away the Phlegm by Vomits or Purges, the remaining Salts do more harm to the Body, than they did when the Phlegm was in it, till they be clogged and carried off by Medicines, or Application, which keeps the Mouths of the Glands open long, and cause extraordinary Discharges, may do harm ; because the Glands first discharge those Juices which are secreted into them, and afterwards as Ducts and Pipes, discharge other Juices promiscuously without sorting them. And if there be not sufficient of every Sort left, neither Digestion, Evacuation, nor &c. can be performed for want of them, or for want of those remaining,

being sharp, or bitter enough, &c. if there be abundance of noxious Matter in the Blood-vessels, as in Fevers, Gouts, &c. when the inward Force of the Steam is abated by Purges, or any other Means, the Compressure without forces the Juices inward, and secretes them into the Stomach and Guts, and they are frequently mortal, if not soon allay'd by Absorbents, or something which sheaths them, or expelled by something which is astringent, raises brisk Steam, and forces them out-

See above, ward, as strong red Wine, &c. And 'tis
 P. 139 very likely, that much Mischief is done in many Distempers, by allowing too weak, or too little Diet, and thereby suffering the malignant Matter to be driven inward, for want of Force to keep it outward, and discharge it that Way. It ought to be well considered, to what Degree of Height the Steam should be kept by Drink or Diet in the Small-Pox, and all Distempers where it is necessary to expell the Matter outward, or from the Stomach, and even in Fevers, what Degree of outward Heat or Cover is necessary to open the Pores, and weaken the Force of the Steam within; what Degree of Cold, where any Thing should be repelled, or whether artificial Cold in
 any

any Case should be used. What they call ^{Effects of} stirring the Humours, by any opening ^{Openers.} Diet, or a Purge too weak to make any considerable Discharge, is only opening the Glands of the Stomach and Guts, and giving Passage for the Juices to secrete more plentifully into them, and whilst that Matter continues in the Stomach or Guts, the Glands will still secrete whilst they have Supplies, or till the Agents be sheathed, or till the Steam rise and shut them. And too much of those Juices will raise a Ferment there, according to their Qualities, too sharp, sour, bitter, or &c. perhaps convulse the Parts of the Stomach or Guts, raise the Steam faster than it can go off, extend the Guts, &c, or raise Steam so sharp, or so hot, that it will hurry too fast along the Arteries, wound them, or &c. And if the Matter taken be noxious, or if there be a great Quantity of noxious Juices issued out of the Blood, cause Fevers, &c. Perhaps 'tis no Advantage to the Body to humour the Palate constantly, for 'tis likely the Matter which gives a disagreeable Taste to the Palate, and makes the Glands discharge, does the same to the Stomach, and causes what we call an Effort of Nature, discharges the Excrements, cleanses the

Effects of
spirituous
Purges.

The In-
conveni-
ence of not
going to
Stool when
Nature
indicates.

the Passages, and prevents any great Quantity of malignant Matter, from lodging in the Blood, Stomach, or Guts. And 'tis likely that Vomits, Purges, &c. which have no Taste, would, if applied to the Palate, as long as they are to the Coats of the Stomach, till their Corpuscles were freed, make the Glands discharge, the Parts convulse, &c. Things which are spirituous, or strong in a Purge or Diet Drink, or during their Operation, or in any Effort of Nature, raise Steam, hinder the Glands from secreting, and force the Matter into the Blood; and after the Operation; whilst the lacteal Vessels are at Liberty to open, and the Stomach and Guts empty, strong Drink, will send off Steam too fast, Heat by Fire, or Cover, or violent Action does much the same. When any Juices secreted, or put into the Stomach and Guts, keep the Valves in the lower Parts of the Guts open or weak, the Excrements will fall downward, and the Steam will sometimes get Vent, and break backwards. When the Excrement and Juices are fallen into the lower Guts, if one be confined, and do not go to Stool to discharge them, they will keep the Glands in the Guts open, let in more Juices, raise a hot Steam, and extend

extend the lower Guts very much, perhaps for an Hour, and afterwards, if you go to Stool, the Discharge will not be so free as it would have been at first, If the Explosion be to any considerable Degree, or there be Abundance of Juices secreted into the lower Guts, among the thicker Excrements, the Ferment will continue, and perhaps the Belly will not settle of a whole Day, or till you have a large Discharge ; because the Juices entered into the thicker Excrements huff and splutter, and cannot suddenly discharge themselves out ; nor is it a small Matter will make the Guts contract, and occasion a Discharge, while there is such an Explosion. 'Tis likely the lacteal Vessels are widest in the lower Guts, and that is the Reason why in Purges, and when those Guts are empty, or extraordinary Ferments there, something goes off into the Blood, which does not, when those Guts are full of crass Matter. How purging Waters operate, what Effects the Cold, Of purg-
ing Mine-
ral Waters. the Water, and the Salt, have upon the Stomach and Guts, in what State they leave Things, vary according to the Quantity and Quality of the Water of the Humours in the Person who takes them, of the Seasons, &c. and require a vast many
Expe-

Experiments, and a Volume to describe them. 'Tis likely, the Waters when they go off, leave the Steam low, and the Stomach contracts, and lets in the Juices, which gives so strong an Appetite. If these Juices come in too great Quantity, they sometimes raise too great Ferments, &c. and frequently cause the Piles.

C H A P. XXIV.

The Use of Clysters, how they operate, &c.

The Intention of a Clyster.

THE Intention of taking a Clyster, is to discharge the gross Excrements, &c. out of the lower Parts of the Guts, which make Stops, or ferment too much, or stay till they are dry. When there wants Juices, in the Glands, to open the Valves, or when they do not secrete, to make regular Discharges of the Excrements, and when the Stomach is too foul, or in so great a Ferment, or so many malignant Juices in the Blood that one dare not disturb it with a Purge. There should be Corpuscles in the Clyster, which will open the Mouths of the Glands in the Guts and Valves, and some thin Fluid for them to act in. Their Action and Effects, are much the same as those of a Purge, as far as they reach. And

What Nature a Clyster.

as

as the lower Excrements are discharged, ^{The Effects of one,} the upper settle downward into their Place, and that in the Stomach succeeds them, and has various Effects, according to the Quality and Quantity, as it hath in a Purge that works not effectually, only, it secretes not the Juices out of the Glands in the Stomach and upper Guts. It abates the Force of the Steam, partly by condensing and clogging it, partly by discharging the Excrements, which raised Part of it, and by making a freer passage for the rest. But gives an Opportunity to the Steam in the Blood, pressed by the outward Air, to force the Blood and Juices into the Vessels and Glands, which compose the lower Guts and Valves, and to contract, and straighten the lower Guts, and shut the Valves closer, and by the Pressure of the Vessels and Glands to straighten the lacteal Vessels, and if it be too often repeated takes away the Juices which should be separated to open the Valves, and discharge the Excrements regularly. Injecting some cooling Juices, as they do a Clyster, might perhaps abate the Steam, and do some Service in some Cases.

C H A P. XXV.

The Use of Diureticks, the Manner how they operate, &c.

The Intention of taking them.

The Time

Their Nature.

Their Effect in the Stomach and Guts.

THE Intention of taking Diureticks is to discharge a greater Quantity of Fluids, Salts, or some other offensive Matter out of the Stomach, Guts, Blood, &c. by Urine. The Time of taking them should be when the Stomach hath discharged what it can, and the Ferment abated. They should have some Corpuscles in them, which will cleanse, or open the Mouths of the Glands in the Passages, Ducts, and Valves of the Kidneys, Ureters, &c. give the Steam Power to discharge the Juices out of them, and thereby widen the Passages, weaken, and open the Valves of the Glands, in the Valves or Neck of the Bladder, weaken them and suffer it to be discharged by Urine. And it is very likely they open the Mouths of the Glands in the Stomach, Guts, lacteal and blood Vessels, and suffer the Steam to secrete some Juices out of them; and these Juices will operate farther, according to their Quantity and Quality, and the Quantity and Quality, of the Matter

ter they carry along with them, out of the Stomach into the Guts ; or in Steam, out of the Stomach and Guts into the Blood, and according to the lesser or greater Force or Activity of those Steams. When the Steam goes off loaded too much with Fluids, or Moisture, it tires, falls by the Way, condenses and goes off by Urine ; when it goes off, with a greater Proportion of Fire, and volatile Salts, more of it perspires at the Lungs and Pores, when loaded with Phlegm, it intangles in, and fouls the Vessels and Blood. We make more Water in cool Weather than in hot ; and when we drink cold or weak Liquors, than when we drink hot or strong ; and the Urine will be thinner and clearer, because less of the thin Matter perspires, and it will be less in Quantity, higher coloured, and thicker when more perspires. I think the Corpuscles of fixed Salts, cannot perspire, without a strong Steam, and great Heat, but generally pass by Urine. If the Steam be weak, and the Guts contracted, and the lacteal vessels pressed, and streightened by the Vessels and Glands in the Sides of the Guts, extended with Blood and Juices, only the thinner Part of the Fluid, will go off with the Diureticks in Steam, and the Urine will be thin and clear. But if the
Diu-

The Effects of
Diureticks
much diluted.

Diureticks go off, with a strong Steam; when the guts are extended and the lacteal Vessels opened, the Steam will carry off crasser Matter into the Blood, and part of it will stick in the small Passages and Glands, and Part be discharged with the Urine. If the Diureticks be in, or given in a great Quantity of Water, they will have various Effects according to the Consistency of the Blood and Juices in the Body. If there be a great Quantity of brinous Juices in the Glands, and the Diureticks open the Glands in the Stomach and Guts, and carry any considerable Quantity of the Juices secreted out of them into the Blood at once, and even discharge them that Way, they may do some Mischief as they pass; and if there be not too great a Quantity of them in the Blood, or stock in the Glands, &c. it will waste them, disable the Blood to supply the Glands, and the Glands to supply the Stomach, with sufficient Quantity to dissolve the Meat, and the Guts to discharge the Excrements. When there is a great Quantity of Fluids discharged, and the Quantity of Fluids in the Blood Vessels, &c. abated, or the Steam weakened, and the diuretick Corpuscles discharged or entangled, the Pressure of the Air, forces the Juices into the
small

small vessels, and Glands of the Blood Vessels, Ducts, Valves, &c. in the Kidneys and Ureters, and they are contracted; or shut till the Blood be replenished with thin Fluids, and Juices, to make the Glands in their Valves secrete, and the Valves open. When the Steam, keeps the Guts extended very much, they press upon the Bladder, and make it capable of containing a less Quantity of Water, and consequently there is a Necessity of discharging it oftener. When we discharge the Water out of the Bladder, the Steam and Excrements frequently push downwards, along the Guts into the Space, in which the Bladder filled with Water was contained, and causes us to break Wind, or have an Inclination to a Stool. Urine in a Vessel kept in Fusion by the Corpuscles of Heat in the Day time, or by the Steam and Spirits in it, continues clear. But when it has stood long, and the Steam and Spirits evaporated, or in the Night, when the Corpuscles of Cold clog the Bodies, they precipitate, and the Urine becomes thinner at the Top, and thicker at the Bottom of the Vessel. The most volatile Parts of any Matter taken into one's Stomach, when the *Pylorus* is open, are in an Instant, carried along with the Steam

How, and when, Urine lets fall its Sediment.

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into

into all, even the most distant Parts of one's Body, and affects all the Parts of the Body with much the same Sense, as those Steams would do one's Palate, if they were belched upward, the different Magnitudes of the Glands, and their Nakedness or Coverture considered. And the Glands in the Mouth generally make an Essay for the rest, that which excites the Glands in the Mouth to open or shut, &c. will do the same, in a greater, or less Degree, to the rest. That which wounds, cuts or corrodes the Glands in the Mouth, will have the same Effects in other Parts, even from the softer Salts to those we call Poison, which when in the small Vessels are forced by the Steam, cut them, and burst out into Parts, where they and it cannot pass, so swell the Parts and stop Circulation. Indeed there are some natural Bodies, and some Compositions, which have Corpuscles in them, that are not freed by the small Heat, nor in so short a Time as Things stay in the Mouth, which will be freed in the Stomach, and act according to their Qualities.

C H A P. XXVI.

The Use of Sweats and Bathing, how they operate, &c.

THE Intention of raising a Sweat, is ^{The Use} to remove some Obstruction in the ^{of Sweats.} Passages, or extend, or open them, or to melt, or dissolve, or thin some Juices which are storkened, stagnated, or thickened in some Part, or all over the outward Parts, or to open the Pores, or discharge some cold watery Juices out of the Blood, &c. which is generally occasioned, by cooling too suddenly, after one hath been very hot, and generally called a Cold. If it be all over the Body, the Steam meeting with Obstructions, causes a burning Heat for want of Vent. If it be in one Part of the Body, because the Blood cannot circulate, nor the Steam get Vent there, it sometimes occasions what they call a Fever; sometimes Pains which they call Rheumatisms, &c. The Time for taking any thing to raise a Sweat, should be when the Meat and Drink is well dissolved and digested, there should be Corpuscles in the sweating Medicine, which will excite a brisk Steam; and

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Cautions
about
Sweating.

the Pressure and Motion of the Air should be kept off the outward Parts to suffer the Heat within to perspire, and to reflect it successively against the Body, thereby to increase the Heat. If the Matter, which offends, be mostly in the Stomach and Guts, and but Part of it be got off into the Blood, a Sweat may throw it off too suddenly, and if there be much of it, cause great Inconveniences. If the offensive Matter be mostly in the Blood, a Sweat may carry off too much of the Juices out of the Stomach and Passages, or carry too crass Matter into the Blood, or dissolve some of the tender or fat Parts, or only discharge the most fine and subtile Juices, and not discharge the grosser so well as a Sweat raised by Action, which when a Person can endure it, is doubtless the most natural and advantageous. When the Stomach and Guts are full of Meat and Drink, especially if the Drink be strong, violent Exercise is in Danger of hurrying too crass Matter into the Blood; and when the Stomach and Guts are so filled, and extended with Steam, stooping frequently, and compressing the Stomach and Guts, presses out the Steam, and makes one sweat more than any other Exercise. As the Sweat, or Juices cannot

cannot issue out of the Pores or Glands in any Part, but where the Force of the Steam within, is greater than the Force of the Air without; nor inward, but where the Force of the Air without, is greater than the Force of the Steam within: So a less Force of the Steam within, will make the Sweat perspire, when one's Body is covered, and the Pressure of the Air kept off, than when one is in the open Air. And if one use Exercise till one be very warm, drink a little warm strong Drink, and cover one's self in Bed, it will make one sweat excessively. When one hath sweat in Bed, or without Action, as soon as the Air comes to the Skin, it presses the clammy Matter to the Skin, stops the Pores, and as it dries, forms a Skin upon their Mouths, becomes a natural Defence whilst their Mouths are open, and afterwards rubs off in Scales. If the Pores be stoppt with phlegmy or scaly Matter, or the Juices in the outward Parts be too thick, or stagnated, or not well mixed, perhaps Friction with a coarse Cloth, or soft Brush, may cleanse and open the Pores in the Skin, remove the Obstructions, open the Passages, break the Clods, thin, and mix the Blood as effectually, as Exercise or

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preferable
to Sweats.

Q₃ Sweat.

When to
be done.

Sweating. But this must be done at Evening, or when the outward Parts are cool, for if it be done in the Morning, when one rises hot out of Bed, it leaves the Parts hot, and the Mouths of the Pores will afterwards stand full of red

Of warm
Bathing.

Humours like Pimples. Bathing in hot Water does much the same thing as sweating in Bed, only the Fluid cleanses the Mouths of the Pores in the Skin, more effectually from what was there, and what issues in Sweat, during bathing. When you have washed the stagnant Juices out of the Pores, the Air presses them together, and the Parts contract, and become more dense or close. Sweating

Of cold
Bathing.

after bathing in a cold Bath, hath much the same Effect, as to that Part. But when one is suddenly immersed in very cold Water, the additional Pressure of the Water and Cold, pushes the Blood and Steam forcibly inward, and the Juices into the Stomach and Guts, especially if they be not too full of Meat, or Drink, or Steam, extends or opens the inward Vessels in a Moment, and by keeping the Pores shut, gives the Steam, farther increased by the Juices, an Opportunity to extend them farther, till in a little Time after one is out, the Steam rises to such a Height,

Height, that it pushes the Blood outward, makes the outward Parts sensibly hot, and if one be covered, throws one into a Sweat. This may remove Obstructions, and open the inward Vessels more effectually, than sweating by Medicine, or Cover, or Exercise. But if there be much noxious Matter in the Stomach or Guts, to be thrown out of the Blood, or into them, will occasion like Inconveniencies as other Sweating doth. 'Tis said, bathing in cold Water often shuts the Pores, and prevents one from taking Cold: but I rather think that it opens the Vessels within, and makes them not so liable to obstruct the Juices, when they are thickened by Cold; and doubtless, it is by opening the Vessels, and giving the Blood and Juices Passage, that it cures the Rickets, Weakness in the Limbs, &c. and it doth this the most effectually in Children, or timorous People, which are most frightened or surpris'd, and make the greatest Effort and Struggle to get out, and thereby augment the Force of the Steam. When the Steam is stopped suddenly in any Part, as by putting the Hands, or Feet into cold Water, it presses more on the other Parts, and most sensibly on the Bladder, or

A Remark upon cold bathing contrary to the received Opinion.

The Reason for the Increase of the Secretion of Urine in the cold Bath.

Partial Bathing or Fomentation.

The Use of Salt or mineral Bathing.

else it condenses the Steam in the Bladder, and lets the Air press in Juices, and contract it, and inclines one to Urine. When one continues any Part, long in cold Water, it makes one urine, by condensing the Steam as it circulates, and make more of it discharge that Way. Bathing. or fomenting any Part, with hot spirituous Liquor, is to insinuate the Corpuscles or Steam of the Liquor into the Part, extend and open the Vessels and Glands, dilate or melt the thick or stagnant Juices, and enable the inward Steam to discharge or circulate them in the Blood. Bathing in salt, or mineral Waters, either hot or cold, is to insinuate the Corpuscles of the Salt, or Mineral into the Pores, to open the Passages, thin the Juices, clog or sheath the Juices, which are too sharp, &c. according to the Quality of the Salts or other Minerals, or the Mixture of them in the Water.

C. H. A. P. XXVII.

The Use of Bleeding.

The Intention of V. S.

THE Intention of Bleeding is to discharge a Quantity of the Blood, when there is too much, or when it is too

too crass, that it cannot circulate and press the capillary Vessels without Pain; or when some of the Vessels are bruised, or broken, that it presses too much, or gets Vent that Way; or when there are some sharp Salts in it, which fret and cut the small Vessels, more when they are extended, than they would do if the Vessels were less extended; or, when the Vessels in some Part, are so filled with thick Blood, that they compress the small Nerves, and cause Stitches and Pain; or, at the beginning of a Ferment, by Matter in the Stomach; or, by too many Juices issuing into the Stomach, which is in danger of expanding it, stretching the Vessels, and hurrying the Blood too much, or when the Steam is so weak, that it cannot thin, or circulate so much Blood. Immediately, as soon as the Blood ^{The Ef-} is discharged, all the Blood-vessels are ^{fect} straightned, the Air compresses those in the outward Parts, and withdrawing Part of the Blood out of the Vessels in the Sides of the Stomach and Guts, suffers the Stomach and Guts to be extended by the Steam; and the Course of the Circulation being altered, makes a sort of a Stop, before the Steam can force it to take its usual Course, and that makes those

Of Bleed-
ing at the
Nose.

those Persons, where the Steam is weak, desperately sick during the Time. If the Steam be strong, the Vacancy made by the Discharge of the Blood out of the Blood-vessels, gives the Steam an Opportunity to discharge a greater Quantity of the Matter in the Stomach and Guts out into the Blood, and that Matter will have the common Effects, according to its Quantity and Quality, the Contexture of the Blood, the Constitution of the Vessels, and other Circumstances. Sometimes, a Pain in the Head, which has continued for several Days, will go off, upon bleeding a small Quantity at the Nose. What occasioned the bleeding, and whether that Occasion, or the Discharge of so much Blood, wrought that Effect, deserves to be considered. If an Increase of Steam, or finer Steam, or Steam mixed with subtler Juices, thinned the Blood, extended the Vessels, and removed the Obstruction, and by rising a little too high, forced the Vessels in the Nose, that Blood might have been circulated, and the Obstruction have been removed without discharging it. And bleeding was only an Evidence of such an Operation, or of its going too far. If that Blood were immediately discharged out of the Vessels which
were

were stop'd, or too much extended, it might give them Opportunity to contract, and so be an Assistant in removing the Pain.

C H A P. XXVIII.

The Use of Cupping and Scarifying.

THE Intention of Cupping and Scarifying, is to discharge some stagnant Juices out of some particular Part, or some of the thinner Part of the Blood, when it abounds too much. 'Tis performed by applying a hollow Vessel to the Part, and discharging Part of the Air out of the Vessel, which takes away Part of the outward Resistance, and gives Liberty to the Steam within, to force such Part of the Juices and Blood, as will enter into the Vessels in that Part, to fill the Vessels and extend them, and the covered Part, and lancing or cutting the Skin and Vessels, gives the Steam an Opportunity to discharge the Blood and Juices; and it hath much the same Effect as bleeding, only it may take away more of the Juices stagnant in that Part; or, if there be none stagnant in that Part, more of the thinner Part of the Blood, and leave

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leave the Remainder thicker. If a Gut or Bladder were fixed upon any swelled Part with a Frame, or tied at each End, and secured with some cleaving Matter, that Air could not get out, and more Air were forcibly pumped in, so as to make a strong Pressure, what Effect would it have? Would it not repell the Humours, make them circulate, and contract the Part? Or, if a Man were put into a large Vessel, and Air pumped in, and the Pressure made stronger, would it not force the Juices into the Sides of the Stomach and Guts, and the contrary, see p. 49.

C H A P. XXIX.

The Use of Blistering.

The Use
of Blisters,
and how
raised.

THE Intention of Blistering, is to discharge some of the thinner Juices out of the Blood, when a Ferment hath thinned the Blood too much, or when there is too great a Quantity of small sharp Salts, or other like pointed Bodies in the Blood. And is performed, by applying some sharp Corpuscles to the Skin, which will open, and cut, the capillary Vessels which compose the cuticular Glands, &c. and by a Plaister, or some cleaving Matter

ter, which will keep off the Air, and suffer the Steam to open the Pores, and those Corpuscles to enter, and be moved by the Steam in the Juices of the Glands, and that which they discharge. And after their Operation, and the Skin's being taken off, by continuing a Plaister of some cleaving Matter to keep off the Air, and suffer the Steam to discharge the Juices at the Ends of the cut Glands, and to prevent the Air and Fire, Salts, &c. in it, from wounding the Ends of the Glands, or drying the Juices which issue out, and pressing them into a dead Skin or Scab, which would stop the Discharge. If Occasion require they repeat some small Quantity of sharp Corpuscles mixed in the Plaister, which will gently open the Pores, when applied to the Skin, or to the Ends of the cut Glands, to encrease the Secretion, or add Corpuscles of the contrary Quality to decrease it. Whether a Blister discharge some volatile Salts, or &c. which will not subside, and go off by Urine, nor at the outward Pores, but only into the Stomach; or whether taking some away, only lessen the Quantity which would have been secreted into the Stomach, and consequently the Sharpness of the Ferment; or whether they fretted

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Effects.

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the Glands in the Blood-vessels, and made the subtle Juices in them, secrete too much, so as to disorder the Constitution of the Blood, as Vinegar, which though not visibly prejudicial to the Stomach, yet is mortal when injected into the Blood, and lessening their Quantity abate that Effect, I have not had Opportunity to observe. Doubtless, some of the sharp Corpuscles applied in the Blister, will, as they enter into the small Blood-vessels, be carried along with the Blood to all Parts of the Body; and will have various Effects upon the different Parts, according to their different Constitution; and will more, or less open, or wound the Glands, and cause Secretion in all Parts of the Body, till those Corpuscles be blunted, sheathed or discharged. And when the Glands in the Stomach, Guts, or Blood-vessels, are opened to a great Degree, or as it were wounded, they will issue Juices against a great Strength of Steam for a while, as the small outward Vessels will do Blood or Juices, when they are wounded or cut, against the Pressure of the Air; because where the Parts are cut, there are no Valves to shut. 'Tis not strange, that those Corpuscles should pass, if those of Oil of Turpentine only touching the outward

ward Skin can insinuate themselves, so into the Pores, and thence into the Blood-vessels, that the Urine shall smell strong of it. The Matter discharged by the Blister will be composed of Corpuscles of that Magnitude, or Juices of that Consistency, which the Glands or capillary Vessels, opened or cut, could discharge: For if the Passages, as one may say, in the several Strainers were not of different Sizes, the Juices, secreted in each Part, would be the same. When any one hath a Blister, outward Wound, or is accustomed to have the outward Piles upon a sudden Stoppage of the Pores in any other outward Part, as by shaving the Head with cold Water, going wetshod, Absence of Cloaths, or other Defence from the Cold, the Steam within, acts more forcibly upon the weak Parts, which are kept warm; and the blistered Place, or Wound, will run, or the Piles break out, and bleed more than they would otherwise have done. Increasing the Force of the Steam within, by strong Drink, Action, &c. will have the same Effect. If one have a small Appearance of the Piles after a Stool, pressing them gently with one's Finger End, will put them up into the End-gut. If that be omitted,

Vid. above
p. 101.

Blifters not
riling, a
bad Sign.

omitted, till the End-gut be filled with Steam, though you push them up, they will return. But if you break Wind, and then put them up, they will not return; so 'tis likely, when one hath the Piles, if one put up a Pipe with Holes in the Sides, and let off the Steam, one might then put them up. I think it is accounted a bad Sign when Blifters will not work. If the Steam rise not, or pass not, or the thin Parts of the Blood be born off, or the Blood be stagnated, Blifters will have but small Effect, nor the Patient continue long without some Change.

C H A P. XXX.

The Use of Issues, Rowels, &c.

The Use
and In-
tent.

THE Intention of making Issues, Rowels, &c. is to discharge some Matter out of the Blood, which is too gross to be secreted in proper Time, at any of the natural Places for Discharge, nor at the Glands cut by a Blister, but must be discharged at wider Glands or Vessels, cut and kept open, and defended from the Air. And such Glands or Vessels will discharge thicker Juices in Proportion to their Capacity; and perhaps,
but

but very little of such Humour as is discharged at the smaller Glands. See the Description of the Ducts, &c. above. When crass Matter stops any small Passages in any of the Blood-vessels, every Push the Steam makes, it, and the Blood push against the Matter stopped, and must rebound back, and take the next Passage behind to circulate; and by Degrees more crass Matter lodges in the Vessel between it, and the next Passage behind, and extends the Vessel. If the Corpuscles of the Matter be blunt, they swell the Parts; if sharp, cut them, and are extravasated, cause Pain; and if they stop while they ferment, and be sharpened too much, cause Inflammations; and some of them cut their Way, or get Passage into the Blood, affect the Stomach, and other Parts, cause Fevers, &c.

C H A P. XXXI.

The Use of Plaisters and Ointments.

THE Intention of applying a Plai-The Use.
ster, or cleaving Matter, to any Part out of Order, or to a Wound, is to keep off the Pressure of the Air, and suffer the Steam to discharge what is neces-

Effect.

Use of
Oint-
ments.

fary at the Pores, or cut Ends of the Vessels, and to prevent the Air, Fire, and Salts, &c. in it, from wounding the Ends of the cut Vessels, or drying the Juices, which issue out, into a dead Skin or Scab, which would stop the Discharge. The Effect of the Plaister is various, according to the Corpuscles mix'd in it; if they be sharp, the Mouths of the Vessels will be kept open, and make a great Discharge; if contrary, they will have contrary Effects, &c. When the Vessels are torn, and some broke inwardly, the Wound is more difficult to be healed, than when they are cut in a Line, because the Ends of those broke inward cannot be come at by the Plaisters, the Air, or any Thing applied outwardly to stop them. The Intention of using Ointments, is very different, according to the Composition and Qualities, of the Corpuscles in the several sorts of Oil, or of those of various sorts of Matter mixed in them. Those of soft Parts, keep the Humidity or Moisture from evaporating, and keep the Parts supple. Those, which have spirituous Corpuscles in them, enter at the Pores, and do much the same thing, as Spirits do in Fomentation. Those, which have Corpuscles

pufcles of fharp Salts in them, corrode the Parts, &c.

C H A P. XXXII.

The Ufe of fmoking or. chewing Tobacco, &c.

THE Intention of fmoking or chewing Tobacco, or, fuch Things as open the Glands in the Mouth, fhould be to difcharge the Saliva or Spittle, out of the Glands of the Mouth, when there is too much of it in the Blood, or it flows into them, in too great Abundance, or is too crafs, or too fharp, &c. Any Thing that hath Juices or Corpufcles in it, which open the Glands in the Valves; which fhut thofe Glands, thereby weakens the Valves, and gives the greater Glands Opportunity to difcharge. If thofe Corpufcles reach the Valves in the Throat, they open the Glands which compofe them, fo weaken them, and makes one like to vomit. Thofe, which only reach and open the Glands in the Mouth, may by the Juices iffuing out of thofe Glands, one after another, fucceffively downward into the Stomach, open the Glands, and let the Juices fecreté there, and thofe ftill

The true Ufe of fmoking or chewing Tobacco.

The manner how they operate.

Of the
too fre-
quent Use.

secrete downward ; and as it doth often, occasion at first an Inclination to vomit, and afterwards to a Stool. Or, that Juice may raise some little Ferment in the Stomach, take off the Sense of Hunger, and make one brisker. But it is likely, the frequent Use of it, widens the Ducts that secrete the Juices out of the Blood, into the Glands of the Mouth, contracts those Glands by discharging them, before they are full, and thereby diminishes and weakens the Parts of the Mouth, alters the Qualities of the Juices by making the Ducts wider, and by taking them away before they have rested, and, as one may say, been digested or prepared by staying a due Time in the Glands, or before they be duly separated out of one into another, or some back into the Blood, and perhaps lessening the Quantity necessary to supply other Parts, for other Uses. And if it do the same Thing in the Stomach, it wastes the Juices by small Quantities, and lessens the Stock which should dissolve the Meat at Meal Time, and so does all little Quantities of Coffee, Tea, &c. 'Tis possible, some small Quantity of the small sharp Corpuscles in the Tobacco, may enter in at the Glands, and so into the Blood, and be circulated in it.

But

But so small a Proportion of them will be distributed to the Stomach, that the other seems more likely, yet they may contribute jointly. The Corpuscles in different Bodies and Fluids, either open the Glands in different Parts of the Mouth, or different Glands in the same Parts, or open the same to a different Degree of Wideness, so that different sorts of Juices issue: As Smoking produces Phlegm; Chewing, Spittle; Salt or Allom, a Fluid as thin as Water. And it is likely the Case is the same in our Stomachs, for stale Beer makes one sometimes puke an acid pungent Juice; Oil, a bitter Phlegm, &c.

C H A P. XXXIII.

The Use of Snuff.

THE Intention of taking Snuff is to ^{The Use of Snuff.} open the Pores in the Nose, &c. and let the Steam discharge the Juices out of the Glands, or to make one sneeze. Whe- ^{The Ef-} ther the Juices discharged there make ^{fects.} other Glands open, and discharge Juices successively downward to the Lungs, and those Juices fall upon, and stop the Pores there, or whether some of the Particles

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of Snuff when taken, or some Salts or Corpuscles in the Air, or the Steam issued out of the Glands opened in the Nose, pass down towards the Lungs, open the Glands, and make them secrete, I am not certain. But when any Thing opens the Pores in the Nose, the Steam makes a Stop, extends the Lungs, and breaks out with strong Efforts to remove the Agents which offend. When the Steam is weak, or heavy, Admission of Cold to any of the outward Parts, stops the Steam there, and causes it to press harder upon the Glands in the Nose, and open them, and presently there succeeds a Stoppage, and those Efforts in the Lungs, or upon them, which we call Sneezing. Shutting the outward Pores by Cold, makes a greater Quantity of Steam necessary to be discharged at the Lungs, which occasions Sneezing, by increasing Inspiration suddenly, as is described below. The Neck of the Wind-pipe is so contrived, that when any Thing touches it, it shuts, or when the Duct to the Stomach opens, it shuts, else Fluids, &c. would get down to the Lungs. When any of the Parts about the Throat are swelled, and the Glands straightened, they secrete sharper Juices, which we call Rheum, which wounds

wounds or tickles the Parts. And when any Thing touches or offends the Neck of the Wind-pipe, the Lungs extend, and the Air and Steam are push'd forth with strong Efforts, which we call Coughing, to remove the Agents which offend. When the Blood is too phlegmy or too sharp, that it stops and offends the Lungs, it occasions like Efforts; for extending the Lungs, depresses the Diaphragm, which returning suddenly to its natural Situation, makes those Efforts, compresses and jirks the Stomach, which heightens the Ferment, and by sudden Pushes, forces the Matter downward, or into the Blood, and along every Passage in the Body, and the like Matter out of the Lungs upward. Whether stopping or straightning the Neck of * the Wind-pipe makes the Wind and Steam in the Lungs make the Effort; or, whether some Juices get down, and obstruct the Steam from issuing out of the Lungs, and its breaking out makes that Effort; or, whether upon offending the Muscles they make that Effort, I am not certain.

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C H A P.

* A convulsive Respiration occasions Sneezing; as from a violent and quick Return of the Diaphragm before depressed, by a deep Inspiration, or a full Dilation of the whole Thorax.

*The Use of Alkalies, Absorbents, Astringents, Sweetners, Opiates, &c.**Their general Effects.*

THERE are abundance of Medicines which they call Alkalies, Absorbents, Astringents, Sweetners, Opiates, &c. which either stop the Mouths of the Glands which secrete the Juices into the Stomach, &c. or entangle or sheath the Agents, or adhere to and load them, so that they cannot move, or move but slowly; and whenever any, or all of these are done, there is a Stop or Diminution, put to the natural Discharges of the Excrements, &c. and whether the Juices be stopped in the Glands, or the Agents clogged in the Stomach, Guts, &c. tho' it be even by Jesuits Bark, the most powerful of them all, whenever a Purge or any Thing opens the Glands, or divides the Agents from their Clogs, the Fever or other Disorder returns. And if the Agents have been long stopped, and their Number or Quantity increased, the Disorder is increased in Proportion. And if they be not some Way discharged, they get loose by Degrees, and do Mischiefs
of

of other Sorts. Since we cannot see the Operations in the Stomach, Observations and Experiments should be made, how Agents, which we suppose to be in the Stomach, Guts, &c. act upon such Matter as we put into the Stomach, where we can see them, before we make Experiments with them there. And Experiments should be made upon Brutes, to know what Effects the several sorts of Diet have upon their Stomachs, whether it be possible to contract their Stomachs, and cause the Glands in them to be replenished with Juices, and then take out their Stomachs before the Juices secrete, to try what Effects those Juices will have, put into the Stomach of a living Brute of the same Species. Thus to put the Juices in the Stomach of a Calf, of which they make Rennet, into the Stomach of another live Calf, &c. or to try what the Juices of the lower Guts would do, if they were injected like a Clyster, or what the Gall, or other Juices put into the Stomach, &c. would effect.

CHAP.

THE HUMAN FRAME.

CHAP. XXXV.

*Conjectures about the Use of Bitters.**Our Juices
and Dis-
tills.*

AS our Bodies are framed to secrete great Quantities of Juices into the Gall-bladder, Pancreas, and Glands in the Stomach, and store them there, 'tis very likely those Juices are necessary Agents; and since those in the Gall-bladder, and some of these in the Glands of the Stomach, are extremely bitter, Experiments and Observations should be made, what Effects those Juices or Bitters have in Fermentation. The greatest Use we make of Bitters, is to prevent Fluids from turning acid by long keeping, or the repeated Fermentations occasioned by Change of Seasons, &c. and preserve fluid Juices fit for Nourishment, as Salt doth Flesh and other Solids. Whether these bitter Juices are intended, to prevent the Juices or Excrements within us, from turning too sour by Fermentation, &c. or what other Uses they are intended for; how they perform that, or their other Operations; what Effects they have when mixed with volatile Salts, acid Salts, Sea Salts, Oil, Phlegm, &c. in a fermenting Fluid,

fluid, deserves to be tried, observed and considered. Whether they adhere to, clog and balance some acid Corpuscles, which divide the Bodies in the Fluid too small, and free other sharp Bodies, so as to render the Fluid acid; or, whether they assist in dividing the Bodies in it to such a Degree of Smallness, as may prevent their Precipitation. They seem to be very small and penetrating, but in Time they sheath themselves in something in the Fluid, and they lose their Effects upon our Palates, and their Effects are at least, not so sudden upon our Stomachs. Almost all Sorts of Bitters, taken naked into the Stomach, heighten and thin the Steam, and perhaps irritate the Glands in the Stomach, and make them secrete. At what Time the Gall-bladder and Pancreas issue their Juices into the Duodenum, whether when the Steam is weakest there, and so the Juices are the least resisted; or, when the Steam is strongest in the Duodenum and upper Guts, whereby their Position may be altered, or their Juices pressed out. This might, if ascertained, lead to discover their Uses, whether they be to heighten or slacken the Ferment. If the Juices in the Gall-bladder and Pancreas be discharged only
into

What they
seem to do.

See p. 85.
and the
whole
Chapter.

into the Guts, 'tis very likely their chief Use is to prevent the Excrements, which sometimes undergo a long Fermentation there, from turning acid. And 'tis like some Position of the Guts, which the Condition of the Contents puts them into, when they want this or that Juice, gives it an Opportunity of venting into them.

C H A P. XXXVI.

Observations upon, and Comparisons between the Effects of volatile Salts, and Sea Salts or fixed Salt.

ALL vegetable Matter contains active, and volatile Salts and Spirits; some acid, some pungent, some sheathed or blunted, but all entangled with Cotpuscles of the Plant which contains them, so as to affect our Palate with various Sensations, as hot, bitter, sour, sweet, &c. and our Noses with various Smells. All fresh Water contains some mineral, and some vegetable Salts, and all Creatures live upon vegetable Matter or Water, or upon the Flesh of one another; and the Juices of Plants, Vegetables and common Water, yield little Sea or fixed Salt. No Creature

ture but Man, especially of those at Land, or in the fresh Rivers, which we live mostly upon, except Pigeons and Bees, use Sea Salt in their Food. Nor does any Creature but Man prepare Meat by Fire, and though Fire bear off some of the volatile Salts, and the most volatile Part of the Juices in the Meat, yet it agitates, and divides, and frees, more of the active and volatile Salts, remaining in the Meat, from the Corpuscles of the Meat, and the Corpuscles of the Meat from one another; makes the Salts more sharp and active, and the Meat more easy to be dissolved, and does much the same Thing, as the Sun does, in ripening Fruits, &c. only the Sun does it more leisurely, and preserves the fine Juices. Man extracts, and prepares, and divides his Drink by Fire, Distillation, Fermentation, &c. eats and drinks more volatile Salts and Spirits, and more freed from animal or vegetable Matter, and more sharpened by such Extractions and Preparations, than any other Creature. Man eats most of his Meat, and drinks some of his Drink hot; keeps his Body more defended from the Air by Cloathing, Houses, Bed, Fire, &c. and consequently hotter than any other Creature. Citizens, more than Country People, where

Observations upon human Diet, and the Manner of preparing his Meat.

Upon his Drink.

His manner of using his Victuals, Of his keeping himself as to Warmth.

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Brutes, and
their Li-
ving.

Why
Man's
Health less
constant
than
theirs?

where the Air is more replenish'd with volatile Salts, Corpuscles of Fire, &c. raised by the great Number of Fires, respired from the People, &c. and the Air thereby less able to discharge such from the Lungs, &c. Country People more than the wild *Indians*, &c. The Stomachs of Brutes, which live upon cold raw Plants, nay, some of them, without drinking any Fluid, can digest them. The Stomachs of Brutes, which live upon dry Vegetables, and simple Water, can digest them. The Stomachs of Brutes which live upon raw Animals, and drink a small Proportion, or no Fluids at all, can digest them, Bones and all. And all of them discharge their Excrements regularly; why should Man with Reason to choose, and with Choice of all Sorts of prepared Diet, Assistances of being kept warm, Skill of Physicians, &c. digest his Meat worse, discharge his Excrements with greater Difficulty, and be liable to more Disorders, and more difficult to be set right, or be fed fat at Pleasure, than any other Creature? And more now than formerly? It cannot be for want of volatile, or active Salts or Spirits, that Man's Stomach digests not so well as those of Brutes; because Brutes and Savages, who
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lie out in the Cold, need most of them; and Man in Cities, Towns, &c. takes in more of them, and more freed, or sharpened than any other Creature of his bigness, or in Proportion; and because we use a greater Quantity than formerly in Sugar, Spirits, Brandy, Rack, Rum, Wine, Spices, Coffee, Tea, &c. and because Physicians prescribe volatile Salts and Spirits in Cordials, &c. when we are out of Order; and because those who take a lesser Quantity, digest and discharge better than those who take a greater Quantity. It cannot be for want of keeping our Bodies hot, because Brutes are kept cooler than we; and those who keep themselves but moderately warm, and much in the open Air, digest better than those who keep themselves hotter and closer. And those who keep themselves hottest, are most troubled with Vapours, &c. It cannot be for Want of Exercise, because most Men use more than Brutes do, if they are left to themselves. Nor can it be in Quantity, because every Brute eats more in Proportion than Man. It cannot be by using too much Sea Salt, because we use much less now than formerly, and Physicians forbid the Use of it in most Indispositions, and less of it is used

The Reason assigned.

used by People in great Towns, than by those in the Country. It must be in the Quality, or in too great a Proportion of volatile Salts, or Spirits in our Drink; or by their being too much freed by Fire, Distillation, Fermentation, &c. and made too volatile, active or sharp, and by exciting them too much in our Bodies with Heat by Fire, Cloathing, &c. or, by using the Liquors prepared by Fire too soon before the freed Corpuscles be sheathed; or, too late, when by long keeping, or new Fermentations, they are become acid, or those that are restored by Mixtures of mineral Poisons, or for Want of using a necessary Proportion of Sea Salt with our Meat, or to our Meat, some Time before we eat it. It appears, that the more volatile Salts and Spirits we take, and the more they are freed, and the more Heat, the quicker the Ferment will be, and the opener the Pores, and the sooner the fine thin Fluid will go off. And when they are too much freed, 'tis likely they go off before their Work be done, and leave the crasser Matter not sufficiently dissolved, nor carry it off the Stomach. But if they did do that, one cannot discharge them when their Work is done, for they carry off the thin volatile Matter,

Matter, out of the Guts and Blood-vessels, leave the Excrements in the Guts too crass, and the Blood too thick, or deprived of proper Juices for discharging the Excrements, so Heat and enflame the Parts, &c. Since Custom hath prevailed, and Men will use such Things as they have been accusom'd to, what is the most likely Agent, to temper, blunt, or abate the Excess in Quantity, or Sharpness or Volatileness of those Agents? Since Man-kind did always use Sea Salt, and more lately than now; and since Physicians forbid the using as much of it as was used formerly, and almost forbid it in all Disorders, and since it is their Interest to forbid all Things which preserve us in Health, for what End, did Man always use it? and what Effects hath the Use of it, first, without the Body where we can see it? If the Abyss be as large as some think, and replenished with the same Proportion of Salt as the Ocean, and there be such vast Rocks of Salts in many other Parts, as those discovered, perhaps, there may be one fourth as much Salt, as there is of all terrestrial Matter. And to what Uses, God created such a Proportion of this Globe Sea Salt, hath not, that I know of, been hinted at. The mine-

Conjectures about
its Original Use.

ral Salts and Corpuscles rising by Springs, and the mineral and vegetable Corpuscles rising in Steam, fall down; some, upon the Ground, and some, run in the Water, and it carries them, and others it meets with, into the Sea, and those must be raised thence, or circulate through the Earth upward again. And the Water must leave, as well as take off mineral, vegetable Matter, &c. Whether, the Salt be to make some Ferment in the Abyfs, in order to send up the Steams for Rain, Springs, &c. or to prevent Heat, and the more volatile Salts from ascending, and bearing up the Steam for Rain, &c. too fast, or to what other Uses, besides those we make of it, I undertake not to determine; nor for what other Use, that sort of Salt or Spirit we call Bittern is designed, which abounds so in it. But doubtless these, and the several other sorts are Agents, some to excite, and some to abate that Ferment, which raises the Steam, makes the Water circulate, and this Globe habitable. And the Heat of the Sun bearing off the Water, and leaving the Salt dry upon the Coasts of all hot Countries, where they cannot preserve their Flesh, Fish, &c. without it, seems to hint, that that was one of the Uses for which

which it is prepared. We see, that the volatile Salts in the Juices of the Flesh of dead Creatures, who used no Sea Salt whilst alive; agitated by the Heat of the Sun, and Pressure of the Air, expand the Tubes and Parts, burst them; cut; and dissolve the Flesh, and bear off Particles of the Fluid and Flesh; till none remain; and that they are fermented, freed, and sharpened to that Degree, that in small Quantity, they are very nauseous, and in great Quantity and Degree, infectious. And those Bodies have most volatile Salts; or Spirits in them, or where they have been most fermented by the Disease they died of, or where they have been killed by those volatile sharp Salts; which we call Poison, which 'tis likely cut the Vessels in the Stomach and Guts, and lacteal and Blood-vessels in their Passage; and where the Body is soonest divided; they are most noxious. Nay, even they are volatilized and sharpened by the Ferment in some Diseases in Man and Beast to that Degree, that those which fly off; while the Man or Beast is alive; are infectious, and most so in the hottest; closest Seasons, when there is little Cold to clog them, or little Wind to disperse them. Nay even some Vegetables, such

Its Effects
in preserv-
ing Flesh.

as Cabbages, &c. have Juices in them, which agitated by the Heat of the Sun and Air, dissolve the Plants, and send off Steams which are nauseous, and 'tis likely noxious. And 'tis likely those tender Parts in the Nose, along which the Air we breathe passes, and is an Essay whether it be wholesome or not, by that Sense we call Smelling, is only affected by, volatile Salts, and in various Degrees, by the Quantity, of the Corpuscles, and the Strength of the Agent which moves them, and in various Manners, by the various Corpuscles of the Matter which they bear along with them. Sea Salt, well freed from the mineral Salts in it, applied to the Flesh of any Creature, which had undergone any such Fermentation before, it was killed, and after it is cooled, and the Corpuscles of Fire, and the most volatile Salts are gone off, will, by the Pressure of the Air, be insinuated into the Tubes and Interstices of the Flesh, adhere to, fix and clog the volatile Salts, so that the Heat and Air cannot agitate them when joint; and blunt them, that they cannot act, nor cause any Dissolution of the Parts. When the volatile Salts have dissolved the Parts of the Body too much, Sea Salt will scarce fix them, or in great Heat

Heat when the Flesh cannot cool, the Sea Salt will be almost agitated, and can scarcely fix the volatile Salts and Corpuscles of the Body. Nay, if a sufficient Quantity of Sea Salt, be duly mixed by boiling it in Water, it will fix the volatile Salts in Flesh kept in that Fluid, and hinder them from dissolving the Flesh. I know not, whether Sea Salt hath been tried to fix the Juices of Plants in the Air, but it prevents their Diffolution in Fluids or Pickle. The Salt we call Sugar, sheathed in a mucous Matter, or the Juice of the Cane, mixed with Bodies divided small, or very porous, will clog the volatile Salts, and preserve the Body, if they be kept dry, or not very moist. But when that Salt is dissolved, or freed from that, or some other Mucus by Fermentation, Distillation, &c. it becomes volatile Spirits itself. Whether the Ferment in our Bodies frees the Spirit from the Mucus, or divides it so small, I cannot tell. Sea Salt, applied outwardly to any Part of the Body, burned, inflamed, or itchy, abates or cures the Inflammation. And I think, Sea Salt will stop or abate a Fermentation in Liquor, and hinder volatile Salts from dissolving any Body in a Fluid, and perhaps abate the volatile

Upon Vegetables.

Sugar prevents Putrefaction.

tile Force of Spirits taken inwardly. People in Sieges, &c. who cannot get Sea Salt, but eat their Meat without it, are affected with Scurvy, Itches, * Laxes, Fluxes, &c. and when they get Sea Salt to their Meat, it cures them. Flesh, cured with Sea Salt, well freed from volatile and mineral Salt, does not much incommode the Bodies of Sailors, when they eat nothing but it, and dry Bread for a long Time. Horses that are surfeited, greased, &c. so that they can scarce be recovered by any Medicines, are cured, made sound and fat, by feeding upon the Grass in the Marshes, which the Tide overflows. Sea Salt purges, and I think, all volatile Salts and Spirits bind. Sea Salt, adheres to, and loads the volatile Salts in the Juices of dead Flesh, that as great a Heat as that in one's Stomach, cannot agitate them much. It loads the Corpuscles of Fire, that they cannot bear off the light Corpuscles of the Fuel, which form Smoke; why may it not do the same in our Stomachs, and discharge them downward? Nay, why might not a Quantity of Sea Salt constantly taken, cure Consumptions, and such Diseases as waste the Body? and perhaps if it were distilled,

Its Uses
pointed at
in several
Disorders.

* Diarrhoeas.

distilled, and the Spirits, and volatile Salts taken out that Way, or by Fire, it would be more effectual, than as 'tis commonly used; or Tartar, or any other fixed Salt might have the same Effects. If Flesh in hot Seasons, and hot Countries, need more Sea Salt, to fix the volatile Salts in it: If volatile Salts be the Occasions of most of our Disorders; why may not Bodies alive, too full of volatile Salts and Spirits, and kept too hot, need more Sea Salt to clog, bear down and discharge the volatile Salts and Spirits, and most, when they are most out of Order? Will any of our Absorbents, or &c. have the same outward Effects? or if they had, when taken inwardly, will they not stop the Discharges? The Operations in the Stomach should be first to dissolve the crass Matter, and afterwards to bear it off. Sea Salts, or any Bodies which are angular, and can be born up, and gently agitated with other Bodies in a Fluid, may dissolve the other Bodies by Friction, and not fly off so quickly, or raise so great a bustle, or make so great an Expansion, or carry off so great Burthens, or so crass Matter, as smaller, lighter, angular Bodies may, and may operate more in a thicker Fluid, and lesser in a thinner Fluid than

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smaller

Of leaven'd
Bread.

smaller Salts can. They use, about one third Sea Salt, and two thirds Paste mixed together, and kept two or three Weeks to make Leaven to mix with and begin a Ferment in Dough. Whether the Piece of Dough would, if kept moist, turn acid without the Salt, or whether the volatile or mineral Salts mixed in the Sea Salt, occasion the Ferment, or whether the acid Parts in the Dough, are freed by Friction against the Points of the Sea Salt; deserves to be examined and considered. All sorts of Vegetables are difficult to be digested, by Fermentation, Boiling, or in the Stomach; and Grain, as difficult as any; and the Juices only go off, and the the greatest Part remains in excrementitious Matter. Whether, most of them would not be more wholesome, if they underwent some previous Preparation by Sea Salt; and particularly, whether Bread needs not more Fermentation, or better Preparation for Dissolution, than by mixing it with Barm, which only huffs it up, and which is the toughest, crassest Part, or the Excrements of Drink, makes it swim upon the Fluid, and entangles the active Corpuscles in it, and those it meets with in our Stomachs, makes our Excrements tough and hot, and

and more difficult to be discharged, and hath quite the contrary Effects, that Bread leavened after the Manner aforesaid has, which sinks in the Fluid, is sooner dissolved, &c. As the volatile Salts may do great Mischief, for want of a sufficient Quantity of Sea Salt to clog them, so too much Sea Salt may fix them, and the finer Juices in our Meat and Drink, too much ; make the Blood too thick, and uncapable of furnishing the finer Juices for discharging the Excrements, &c. and in that Case, fresh Diet will be a Remedy, as Salt was in the other. The Quantity and Manner of applying Sea Salt, whether to the Meat before we eat it, and how long before, or whether with the Meat fresh, when we eat it, deserves the most curious Observation and Experiments ; and with Respect to the Quantity of volatile Salts or Spirits, each Person eats or drinks ; the Degrees of Heat they use their Bodies to, &c. Sea Salt, that hath been some Time in the Meat, is in some Measure sheathed with the phlegmy Parts of the Meat. Whether it may not fix the volatile Salts more so, than when it is taken naked into the Stomach, and whether that be not the Cause that it binds us more, deserves also

The Effects of too much.

The Quantity and Manner of using it ought to be nicely consider'd.

also to be considered, and the different Effects it may have by the Qualities of the Matter it shall be taken in. If a considerable Quantity of Salt, be taken in Water-Gruel, or other thin Fluid fasting, may it not fret the Glands of the Stomach or Guts, go off in too great Quantity into the Blood, or &c. more than it would do, if taken with Meat, or thicker Fluids, and the Qualities of the Matter it will meet with in the Stomach, or which may be secreted into it, as Remains of the Meat, Phlegm, sharp Juices, &c. For whatever opens the Glands in the Stomach, will, besides its own Operation, occasion a farther Operation by the Juices admitted into the Stomach, according to their Quantity and Quality, most at first, and as it is repeated, and the Juices wasted, less and less. Therefore I think Salt most proper to be used as a Diet. And when there is too great a Stock of sharp Juices in the Blood, they may be more safely carried off by softer Matter, of which next.

C H A P. XXXVII.

Observations upon, and Comparisons between the Effects of eating fresh Fruits, green Herbs, and dried Fruits, &c.

THE various Seasons of the Year in Nature each Country, and the Difference of ^{points out} the Climate, in Countries of different La- ^{the Time} ^{of using} ^{them.} titudes, in some Measure point out the Uses of the particular sorts of Plants, Fruit, &c. variously adapted; some, only for the present Time, by Reason they cannot be preserved; some for Weeks, some for Months, and some for the Winter Season, because according to their several Compositions, some are, and some are not, liable to rot, corrupt, or decay. The Spring raises the tender young Blossoms and Herbs, whose Corpuscles are light; the greatest Heat raises Fruit and Herbs to their full size, whose Corpuscles are then the coldest or heaviest. In the declining Heat, those Corpuscles are fermented and divided, perhaps some born off, and some others succeed, and thereby rendered lighter or warmer, or ripened. Some, by being kept after gathering, under-

Children
love Fruit.

The Ori-
gin of
Gout and
Scurvy.

undergo a sort of Fermentation, which divides the Juices, loosens the volatile Salts and Spirits, throws off some of the humid, cold Parts, and perhaps admits Corpuscles of Fire, volatile Salts, &c. into the contracted Pores. All Children, and young People, whose Bodies are very hot and uneasy in hot Seasons, are mightily pleased with eating cooling Fruit, and are as naturally inclined to choose it by Experience, as we are to take Food in general, when we are hungry, or Drink when thirsty. The Scurvy, Gout, and such like Disorders in the Blood, seem to be chiefly occasioned by eating such sorts of Food, and drinking such sorts of Drink as assist not, or hinder the Juices from secreting into the Stomach and Guts, and discharging them downward, and the Body is frequently rendered unhealthy, and sometimes even emacipated by the Sharpness or other Qualities of these Juices, abounding in the Blood. Horses kept in the House with dry Meat, especially with much Corn, will not be well without Purgings, or Bleeding, because their Blood grows too sharp, or too thick for want of discharging the Juices into the Stomach and Guts, which will occasion the Yellows, and several other Disorders.

Disorders. When on a sudden, the Season becomes very hot, and the Body is full of volatile Salts and Spirits, the Steam within rarified, and too thin and volatile, and the outward Pores too open, the Blood will be too thin, the Steam will pervade the Blood and Pores, hurry off too fast, and leave the Body hot and faint, and then Alloys are absolutely necessary. Indeed, when the Steam is very strong, hot and subtle, and the Pores open, it bears off grosser Corpuscles into the Blood, and so in Time makes the Blood more difficult to be pervaded, or born off. And when the Corpuscles in the Blood are gross, and the Pores are shut on a sudden, the Steam should not be suffered to abate suddenly. The Juices in new-gathered The different Effects of Fruit, or green Herbs, are capable of raising some sort of a Ferment, green and dry Fruits. in the Stomach, and Guts, either by their Motion in Division, or by their Expansion, or &c. till these Juices are born off, or sheathed or balanced, which those of dry'd Fruit, or Herbs, out of which the volatile Humidity is gone, or the Juices of Fruit or Herbs fermented, will not do. Perhaps it may be the greener, or less fermented, or less dry'd the Meat or Drink is, the grosser the Steam is which rises

rises from it, and therefore goes not off so freely, but extends the Stomach and Guts, or perhaps it may proceed from a greater Quantity of Juices, which they may occasion to be issued into the Stomach and Guts, or from all these Causes jointly. If when the Juices are sharp; and the Steam subtle, one eats a moderate Quantity of cold Fruit, it makes the Steam grosser, and fitter to drive the Blood, and abate the Expence or Waste of the Steam, and by condensing the Steam at first, gives an Opportunity to the Stomach and Guts to contract, and to the Blood to replenish the Vessels in the sides of the Stomach, Guts, &c. with Juices to be secreted into the Stomach; which are the principal Agents to dissolve the Contents in the Stomach, and raise them into more Steam, and into the Guts, for discharging the Excrements downward, &c. Great Caution should be used at the first eating of Fruit, for it is as unsafe for those to eat cold Things who are used to hot, as 'tis for those, who are not used to strong Drink or Exercise, to use much the first Time, because the Glands will secrete too great a Quantity of Juices, and cause a Surfeit or Fever. If cold Fruit, be eat before Meat for some Time;

so that the Stomach contract and discharge the Juices, and these the Excrements plentifully; the Stomach will contract so much, that upon Eating or Drinking at first, you will feel a Fulness, and an Inclination to vomit, and upon drinking a small Quantity of strong Drink, which is necessary, the Pulse will be strong and quick, without any great sense of Heat in the Body. When with eating Fruit, Herbs, or other cooling Diet, there is a plentiful Secretion out of the Blood into the Stomach and Guts, and a free Discharge of the Excrements downward, or a Looseness; it carries off the Matter which filled the outer Parts too full, and leaves the Limbs cool, and of a due Thickness in Man, Horse, Beast, &c. If this be done faster than the proper Juices can be separated into the Glands, and the Glands kept open, the Blood will push the thinnest Juices through the Ducts and Glands promiscuously; those Juices will be unfit for Digestion, and will be wanted in other Parts where they would be useful. As the gross Steam raised out of green Plants or undried Fruit, cannot go off so fast, therefore it extends the Guts, Belly, and Parts of Creatures, whilst they feed upon them, much more than
the

Practical
Hints up-
on these
Observa-
tions.

the fine Steam raised out of dry'd Plants, Fruits, &c. when they feed upon them. When the Muscles and Ligaments, suffer the Steam to extend the Belly out of Course, 'tis not a sign of Strength, but of Weakness, and the Food should be changed, for if the Parts are not supplied with Nourishment sufficient, with the Compressure of the Air, to keep the Guts within their common Compass; as the Strength depends upon forcing the Steatt out of the Stomach and Guts, the more they give Way to the Steam, the more the Strength will diminish. It seems to me, that there is no Method more likely or safe to make the Juices secrete into the Stomach, discharge them downward, contract and strengthen the Stomach, abate the sharpness of the Steam and Juices in the Blood, and restore a good Constitution, than by a moderate Use of new-gathered, or fresh Fruit and Herbs, about an Hour before each Dinner. The Disorders occasioned by eating excessive Quantities of Fruit at once, make the Physicians forbid the Use of Fruit to People in Disorder. But that should no more disparage the Use of it, than the ill Effects of Drunkenness, the Use of Wine, strong Drink, &c. The Inhabitants of the northern

thern Countries, where there is little or no cooling Fruit, are full of the Scurvy. Those of the southern Countries are seldom troubled with it. Those who have been bred in the southern Countries, and eaten much Fruit, and afterwards live in the northern Countries, and eat little Fruit, are most troubled with it; besides we daily see Horses and other Brutes that will eat Grass when they are in such Disorders by dry Food, Surfeits, &c. restored to Health in a Month's Time by fresh Grass, when all other Means have been ineffectual. Observations should be made, whether the Corpuscles of those Plants which cure the Farcy, and such like Diseases, are not very heavy and cold, and of what Nature, and in what Quantity the Spirits and Salts in them are. As Care ^{Cautions} ought to be taken of the Quantity of ^{about eat-} cold Fruit, Herbs, &c. which one eats ^{ing Fruits} and Sal- ^{lads.} at once, because Excess will occasion Surfeits, &c. so also Care ought to be taken of the Quality of them, for there are some Fruits and Herbs so cold, that neither the Juices in the Stomach of Man nor Beast can raise them into Steam, nor discharge them without Surfeits, Fluxes, &c. so also of the Time of using proper Quantities, and of proper Sorts, for if

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one use any sort too long, it will make one pale, and weak. We use Pepper with Cucumbers, &c. which immediately nettles the Stomach, and makes the Juices issue to raise a Steam, and dissolve them. What Operation can two or three Grains of such Matter have in the Stomach, other than in opening the Glands, and raising a quick Ferment? Or how can cold Things raise such a Combustion, as to cause a Surfeit or Fever, if Juices did not secrete? Or how could hot spirituous Things prevent such Combustions, if they did not raise a brisk Ferment, and prevent too many Juices from issuing in? The cooler or heavier the Diet, the more Juices it naturally calls in, and the more of them it carries off, and spirituous hot Things need less Juice out of the Blood to digest them, and so extend the Stomach, and keep them out. If by eating cold Fruit, drinking small Liquor, &c. the Stomach be cooled too much, or kept cool too long, too great a Quantity of bitter sharp Juices flow in, in small Quantity cause Belching, in great Quantity, Surfeits. 'Tis not safe to drink any considerable Quantity of strong Drink, when the Juices are kept discharged out of the Glands by Fruit or other cool Diet, for then

then the lacteal Vessels are very open, and the Steam heightened by the Juices and strong Drink, throws off too much into the Blood. Too much Action will have the like Effects; and the Matter so thrown off, is apt to fall into the Legs or lower Parts: If the Steam be too near spent by Heat; 'tis not safe to eat any cold Fruit, nor scarce any cold Meat, for fear of oversetting the Steam, or occasioning a Surfeit, by making the Stomach contract too much, issue too many Juices, &c. But 'tis more proper to drink a small Quantity of strong Drink to recover the Steam immediately, and after that is done, cold Meat will do less Hurt. If one perceive any Disorder by eating or drinking cold Things when hot; or by fasting, such as the Gripes, &c. which frequently happens, strong Drink, or rather hot strong Drink, taken suddenly, will prevent farther Damage; but if it be taken after the Juices be secreted in too great Quantity, and the Ferment raised, it may do Harm, for 'tis very likely, there may be such a Quantity of sharp Juices in the Body of a healthful Person, which diffused through the Blood do no Harm; but if the Steam in the Stomach were kept condensed till they could be secreted into it,

would raise a Ferment to blow up the whole Frame. Horses, or Beasts with dry Meat, drink as much cold Water as they can at once, if they be permitted twice a-Day, or oftener, which is the only Alloy they have to condense the Steam, contract the Stomach, and give an Opportunity to the Glands in the Stomach and Guts to fill with Juices. A moderate Quantity of cold Water, or other weak Liquor, doubtless condenses the Steam, and makes the Stomach contract; but the Parts of Water are so light, that unless one take a very great Quantity, the Heat of the Body in a short Time takes off the Cold, and raises a Steam before any great Quantity of the Juices can be secreted into the small Vessels and Glands, and thence into the Stomach, and repels the Blood, and extends the Stomach. But when the Body is very hot, the Steam high, and the Juices very thin, and little remaining in the Stomach, if one drink a considerable Quantity of cold Water, it wholly condenses the Steam in the Stomach, and perhaps some may pass down into the Guts before the *Pylorus* can shut, and it will abate the Strength of the Steam issuing out of the Guts, so far, that immediately that which perspires will stick upon

upon the Skin in Form of Water, which the Moment before was born off invisibly, and will continue to do so, if you keep hot, till most of the Water be born off, and if one rest, it may stagnate the Juices so far in the Stomach and Guts, that the Steam will not be sufficient for some Time to circulate the Blood, but the Blood will precipitate, and fall down into the Limbs, and when the Juices issue in Quantity, or one drinks strong Liquor to carry off the Water in Steam, all the Juices return with it into the Blood.

Where a Person keeps his Stomach always extended with hot strong Things, and so fills the Blood full of sharp Juices, vomiting and purging signify little, they only discharge the Juices collected in the Glands when they begin to operate, and after that a Miscellany of all the sorts of Juices which the Ducts and Glands can secrete, and lessen the Quantity of all the sorts that can pass there, and for the present does some Good and some Hurt.

But Part of those Juices get back in the Operation into the Blood, and those which are left behind in the Guts, are not clogged but rather sharpened, and afterwards also get off into the Blood, and if the same sort of Diet be continued, the same

Nothing
can rectify
the whole
Mass but a
constant
Diet.

sorts of Juices will in Time again abound in the Blood, nay even fasting will not correct those sharp Juices, for that will make them flow in, and act almost alone, and become sharper. And nothing will sufficiently change the Constitution of the Blood and Juices, but a constant Diet, which will let the Stomach contract, the Juices come in, clog, alloy, and discharge them downward, and supply the Blood with fresh cool Juices.

C H A P. XXXVIII.

The natural Efforts made by the Agents to remove the Matter which offends or obstructs, and to prevent too great Emission of the Juices outward or inward; in short, to keep every Thing in Order, and to repair every Thing which is out of Order.

All Diseases are Efforts of the Agents to clear themselves.

IT appears in those we do understand, and 'tis likely it would appear so in all the rest, if we understood them, that all those Effects we call Diseases are Efforts of the several Agents to cure those Diseases; and that Things are so surprisingly framed and qualified, without and within us,

us, to preserve us, that not one Disorder befalls us by accidental; nay scarce by wilful Means, but all the Agents conspire to remedy it, so that almost nothing but Violence, or a constant Course of abusing ourselves, can kill us; nor any Thing we can eat or drink, can hurt us much, as it comes naturally, but the Parts offended, will discharge it by vomiting, purging, or &c. except Art has made it pernicious, such as Liquors fermented so much, and kept so long, that they are too acid, sharp and thin, or Spirits which are freed so much, that they are too volatile, &c. which may leisurely lodge a great Stock of improper Juices in the Blood, or such Things as we eat or drink, or use in Physick, which are fermented or mixed with deadly Poisons, pointed Salts, &c. as will appear by repeating a few of the Instances interspersed throughout the whole. When Exercise spends the Juices and Strength, it increases the Steam to supply them. When we are too hot, Heat opens the Pores to discharge the Steam. When the Steam is stopped, its Force increases to remove the Obstruction, when Cold thickens the Blood it shuts the Pores, and keeps in the Steam to thin it. When the Pores in the Skin discharge,

These Effects demonstrated.

less is discharged by the Lungs, by the Urine, by the Glands, by the Nostrils, &c. When any of the Juices are stopt or stagnated, the Steams force their Way, till they remove the Obstacle, or dissolve them, or inflame the Parts, and discharge them there. When there are too many sharp Juices thrown out of the Blood into the Stomach, the Ferment rises till it can discharge them. When Phlegm increases, it straightens the Passages, and stops the Salts to dissolve it. When Salt, or any Thing wounds the Glands, they open, and the Steam forces the Juices to secrete, which opens the Passages to discharge them, when any Thing stops, or wounds the Glands in the Lungs, we cough to throw it off, and those Efforts augment the Force of the Steam. When the Steam drives the Blood with too great Force, thins it too much, and makes too great Secretions, it extends the Blood-vessels, and straightens the Glands. When the Steam is spent, or the Agents too much loaded with crass Matter, we grow senseless till it be replenished or thinned. Upon the whole, it will appear how nice, and how dangerous a Thing it is, for those who go to work in the Dark, know not the Agents that act in and about the Body.

The Necessity of the Knowledge of the Agents.

Body, nor the Laws by which they act, what they are doing, nor which of them prevails to interpose by Force among them. Such must frequently thwart and oppose the Course they naturally take to cure us, weaken, or bind the Hands of those who are assisting us, and strengthen or arm those who are destroying us.

The Circulation of the Blood, though it admit of ocular Demonstration, was not discovered till very lately. And tho' the first who thought of it was one of the greatest in the Faculty, he was scarce able to support himself under the base Treatment he received from his Contemporaries, for attempting that noble Discovery. Therefore as one who is not of the Faculty, and attempts a Thing of this Nature, must expect to be much worse treated, and will not be so able to defend himself by Opinion, Circumstances, or any other sort of Evidence, unless he can prove it by ocular Demonstration (which I hope I shall have Opportunity to do) and even then have no Advantage by it; 'tis the safest Way either to publish it without discovering the Author, which is very difficult to be done, or leave it behind one, those Parts which concern the Agents, which circulate the Blood, to the Judgment of those who understand what

what Laws Nature hath given Fluids to act by; and the Observations which are foreign to that Affair, or the Opinions I have given upon them, to every Man's own Experience,

D I X I.

Harvey, who as hinted above, was not only sure that the Cause of the Circulation of the Blood was not in the Heart; but is for the same Agent with our Author, concludes in a Matter not altogether unlike Mr. *Hutchinson*, therefore we have thought it not much amiss to cite the Passage. *Exercitat. Anatom. 3^{tie}*, pag. 159. "In this Manner I opine, that the innate Heat (or Blood) as it is the common Instrument of all Operations in us, so is it the chief Efficient of the Pulsation of the Arteries; I don't confidently assert this, only propose it as an Hypothesis, and would be glad to know what any of the Learned have against it, but without Scurrilities, reproaching Language, or contumely; and whoever undertakes it thus, will undertake a Work most acceptable to me." See what he means by his innate Heat, in his Treatise *De Generat. Animal. Exercitat. LXXI*. So here he says the Blood alone is the innate Heat, or the first created animal Heat.

C O N-

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